A SECOND OHIO WEED MANUAL

GENERAL WEED QUESTIONS.
REVISED DESCRIPTIVE ILLUSTRATED LIST OF OHIO WEEDS.

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A SECOND OHIO WEED MANUAL.*

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GENERAL WEED QUESTIONS.

INTRODUCTION.

The Station Botanist has been receiving annually during the past ten years a large number of weeds for identification; this number of individual specimens has sometimes reached several hundred. Personal observation bears out the inference drawn from these inquiries, that there is general interest in the Ohio weed problem. Effort in weed destruction is oftentimes misdirected, while precautions against the introduction of new or troublesome weeds are frequently slighted. Suggestions of various sorts in the weed line may have a reason for publication. These suggestions may as rightly call a halt in measures directed against useful plants that tend to spread spontaneously, as to intensify efforts to subjugate real weed pests. The following revised pages are offered to Ohio cultivators in the hope that what appears in them will be of assistance both in recognizing and in dealing with weedy plants.

NATURE OF WEEDS.

Plant life upon the earth is essential. The husbandman is concerned with growing plants first of all, but he seeks to avoid those which are unprofitable. The plants which tend to grow where they are not desired he calls "weeds." Some of these weedy plants have been brought from Europe and Asia, while others are African or American.† They all have this tendency to propagate themselves and to resist man's efforts to subdue them.

*A revised and enlarged edition of A First Ohio Weed Manual, Bulletin 83, 1897, pp. 248-400.

†See the Non-Indigenous Flora of Ohio by Dr. and Mrs. Kellerman, Ohio State University Bulletin, Botanical Series No. 4, 1900.

Weeds are plants out of place. But we may add that man's ideas of place are here considered. Civilized man has disturbed or overturned conditions existing at his advent in America, introduced and cultivated a variety of plants and brought in, with or without intent, a goodly number that now torment him. Cultural conditions have been maintained, and weeds as long accustomed to these conditions as the cultivated plants themselves, in some cases even longer, flourish under them. They make the host of introduced weeds. Besides, certain native plants are occasionally better adapted to the new conditions than to the old; they accordingly thrive. Both the naturalized and native plants crowd the cultivated ones. We thus perceive that some weeds are inevitable when the wilderness has once been broken. The number of weeds, and the damages resulting from them, will be altogether a matter of the wise efforts, both individual and collective, that are expended for their destruction. Weeds are destroyed or subdued that more valuable food plants may be grown.

Upon a railway track or right-of-way any plant growth is unsightly or a possible menace. From this point of view leaking grain as corn, oats, wheat, when "starting to grow upon the track" supplies a new type of weeds.*

HOW WEEDS INJURE THE HUSBANDMAN.

Weeds injure the husbandman in a variety of ways. They injure by offending his æsthetic nature, his taste; also by threatening, as his judgment assures him, conditions of taste or profit for the future. The æsthetic side is a large factor in depreciating the value of weedy and carelessly kept homesteads. This sort of injury is shared by the whole community when thoroughfares, be they public canals, railroads or common roadways, are permitted to remain uncared for.

Weeds injure by reducing the crop yield. It is the crop loss that receives more common estimate when damages from weeds are counted. 1. Weeds rob the soil of moisture. 2. Weeds crowd other plants, thus depriving them of light and of space in both soil and air. 3. Weeds take up the flood elements which are needed for other plants. 4. Weeds may harbor injurious fungi or insects. 5. They injure by killing stock (sheepkill) or by rendering milk offensive (wild onion). 6. Weed seeds render certain products of the farm, such as clover seed, wheat and the like, unmarketable. Other injuries might be enumerated and will suggest themselves.

*See Stair, L. D. Railroad Weeds. Proc. Ohio Acad. Science 8:44-59:1900.

Perhaps the first point, robbery of the soil moisture through weeds, is one of the chief; this is especially true in fruiting orchards during drouth, when any removal of moisture by other plants may cause serious damage. I regard the robbery of moisture as a leading form of injury. Crowding causes large injury, particularly to young seedlings in cultivation. The third form of injury is general, like the first and second, but probably has been given its full value. Soil robbery and crowding as well as many other forms of injury will be in proportion to the number and growth of these persistent invaders. Enlightened practice will appreciate the matter of harboring injurious fungi by weeds, as for example, barberry and wheat rust; the same applies to insect harbors.

The simple cost of weed removal along the railways of the State of Ohio is placed by Stair at over half a million dollars per annum.

INTRODUCTION AND SPREAD OF WEEDS.

We have seen that weeds arise from their adaptation to the conditions man has brought about on the earth. The mutual plant and soil characters count for much here. With the continuous changes being wrought, new plants come into any given region. Some of them prove adapted to the conditions offered and show great powers of growth and reproduction. The Russian thistle illustrates the point fully. Bracted-plantain, broom-sedge, penny-cress, spreading mustard and a host of others give the same evidence. Yet plants may grow harmlessly for a long time in a given situation to become aggressive in another. The tickseed sunflower, *Bidens trichosperma*, is found in swampy places. In a part of Mahoning county, as reported by Mr. Vickers, it became transplanted to upland roadsides, showing remarkable vigor in this new habitat. While a slight change of location may result in a change of habit, by far the commoner source of new pests is by introduction from remoter regions. There appeared in Ohio, to the writer's knowledge, in 1896, two plants newly introduced from Europe, both of them new to the United States as well as this state. They are a very small flowered catchfly, *Silene conica* L., found in crimson clover at Clyde, Ohio, and sandwort plantain, *Plantago arenaria* L., in the city of Dayton, (Fig. 56). It is to be noted that this is the third of the introduced species of plantain—narrow and bracted-plantain are quite well known as weeds in Ohio. Half a century ago numerous species, now weed pests, were unknown in the state.

Weedy plants become introduced unintentionally, in seeds, in packing material, and so forth. The catchfly just mentioned came in crimson clover seed; the Russian thistle in flax seed, while bracted-plantain, Croton, and gum-weed have been introduced in many Ohio counties in western clover and alfalfa seed. Prickly lettuce is dispersed in this manner; charlock and spreading mustard are scattered in oats, the latter by sticking in the slit, while sorrel, narrow plantain, panic-grasses, foxtail and others, are similarly dispersed. Once within a region, weeds become scattered by many special means. Some are spread through the enclosing parts of the seeds that attach them to animals by means of prickles, like cocklebur, sticktights, tick-trefoil, Spanish needles, beggar's-lice, hound's-tongue, agrimony and bur-grass. Yet other seeds are provided with a hair-like parachute to render them buoyant and thus be readily transported by the wind. Dandelion, thistles, milkweed, dogbane, prickly lettuce, asters, goldenrod and white-top have this abundant attachment to insure them wide dissemination. Occasionally weed seeds are provided with wings, as in the case of toad-flax and spurry; the catalpa among the trees has similar wings. One of the unusual adaptations is in the case of spreading mustard seeds which are so small as to become lodged in the slit of oat seeds.

CLASSES OF WEEDS.

Weedy plants are classified according to their life period:

I. Annuals, marked (A) in the weed list, are those weeds which grow from seed each year or season and die after ripening seeds again. Ragweed, crab-grass, buffalo-bur, pigweed, lady's-thumb, lamb's-quarters, Russian thistle, purslane, foxtail, and a multitude of others are of this sort, and may be called summer annuals. Many of them are troublesome pests.

Some of the general class are winter annuals. They spring from seed in late summer or fall and survive the winter in the shape of small seedlings. White-top, prickly lettuce, shepherd's purse, spreading mustard, chickweed and dead nettle live over the winter in this manner. Chess, spelt and rye grow in the same way.

II. Biennials (B) grow from seed but do not produce seed until the second season. Wild carrot, wild parsnip, common thistle, winter-cress, burdock, teasel, sweet clover, hound's-tongue and mullens belong here.

III. Perennials (P) live year after year without renewal from another source. They grow from seeds, or from rootstocks and subterranean stems; once started they continue in the same spot or spread about it. All woody stemmed pests like briers, sassafras, roses, etc., belong here. But of the herbaceous perennials we have two classes according to underground propagation:

1. The pests with creeping or underground stems, by which the plant spreads: Horse nettle, Canada thistle, toad-flax, mints, moneywort, field bindweed, common bindweed, cypress spurge and bouncing-bet illustrate these features.

2. Perennials with ordinary roots and not spreading underground. Bulbous and tap-root weeds are in this class. Chicory, goldenrod, aster, vervains, motherwort, broad and narrow plantain and mallow have this character of root.

Lists of "worst," "bad" and "indifferent" weeds are of great interest, yet the plants in a list of "worst" weeds can not usually claim a wide range. Sorrel is the worst weed upon the Station farm when a period of years is considered. Other locations will quite likely exhibit an adaptation to some other plant and therefore show some other "worst" weed. There are about one hundred weeds in Ohio that are always troublesome. Indifferent weeds are simply of less importance, for the time, than the plant under culture.

VITALITY OF WEED SEEDS.

Weeds spring up sometimes in a most perplexing manner. After two seasons of comparative freedom from white-top, *Erigeron annuus* L., in clover, the fields were white with it in the summer of 1897. Similarly, white clover may cover nearly all old grass lands. Chess grows in wheat, mustards in clover, chickweed and shepherd's purse in gardens and ragweeds in wheat stubble about as often as the wheat rotation is repeated. An old hut is cleared away and new plants come into life where it stood. Earth from ditches, from wells and from cisterns is scattered but to bring forth strange growths. Hasty conclusions may easily be drawn from these occurrences. It would appear possible to explain most of them upon natural grounds. Take the example of white-top in clover fields: the season of 1896 was one of abundant rains throughout. We have but to conceive of the presence of seeds in the soil, a reasonable assumption based upon the seed's powers of dissemination, which germinated under the continued warmth and moisture. The same explanation appears to hold good for white clover and accounts for its prevalence. Sorrel likewise was unusually prevalent. It has been found by Dr. Beal,[1] that shepherd's purse, peppergrass, May-

[1] Agricultural Science, 8: 283.

weed, mullen, curled dock and others retained their vitality after being buried in the soil for fifteen years, but that they germinated slowly afterwards. The same author[1] later finds that some of the seeds of pigweed, black mustard, shepherd's purse, Virginia pepper-grass, May-weed, evening primrose, smart-weed, purslane, curled dock, foxtail and chickweed germinated *after having been buried for twenty-five years in sandy soil.* Clover seed, likewise, retains its germinating power for many years when buried. Continued moisture and warmth or continuously favorable conditions are needful to sprout these buried seeds. Just such conditions prevail in a wet season. Following rainy seasons, therefore, we may certainly expect weeds of several sorts to reappear.

One needs but to take earth from shallow depths in cultivated fields and place it for several weeks in a warm room or greenhouse, keeping it moist meanwhile, to learn how many buried seeds lie dormant in the soil of such fields. These tell of what has gone before; they are silent but capable witnesses. Buried seeds explain a multitude of asserted mysteries, and moreover, they must be duly estimated when one undertakes to keep a clean account with a crop. This stored weed seed is the account that generally shows a large credit balance.

AVOIDANCE AND DESTRUCTION OF WEEDS.

Successful measures in destroying weeds are founded upon a knowledge of the life of the weed and of its manner of propagation. To avoid introducing or propagating weeds is better than to expend labor destroying them. Some principles of weed destruction may be applied universally. All are based upon a knowledge of the plant to be destroyed:

1. Strive to prevent the seeding of all weedy plants and the introduction of weed seeds. This if attained will be sufficient to subdue annual and biennial weeds. It is valuable with all classes.

2. Perennial weeds of all sorts, and especially those with underground stems or extensive root systems, must be cut repeatedly to starve out these subterranean parts. With this class green leaves are the feeding organs and must be removed. Salt, coal oil, (kerosene) or strong sulfuric acid may be applied with or without cutting to reach the same end. Cutting is probably the cheapest of all these effective measures, unless it be salting. Man-of-the-earth, Canada thistle, horse nettle, bouncing-bet and toad-flax suggest themselves at once as examples under these suggestions.

[1]Beal, W. J. The Vitality of Seeds, Bot. Gaz. 42:140-143; 1905.

3. Weeds that are "indicators," i. e. diagnostic of soil conditions, are most cheaply controlled by removing the conditions. Drain wet places to avoid sedges, apply lime or fertilizers to crowd out sorrel. Let the despised sweet clover show what is the matter or what the special excellence in uncultivated land.

4. Persistence in the destruction of weeds by simple methods counts for much more than spasmodic effort, and oftentimes for more than expensive processes. It would appear to some persons a waste of time to spend two seasons in eradicating a small patch of Canada thistles, although but a little time is required at each cutting; the chief element is thoughtfulness. The same persons would spend more time at once in efforts to dig them up completely, only to find when the time has been spent, that the weeds, whatever their name, have been spread by the process.

Some weeds may be eradicated while others may only be subjugated. Canada thistle is often eradicated in a particular spot, while for prickly lettuce this is a recurrent problem everywhere. The latter can not now be eradicated, while it may be subdued. Other examples may be cited in docks, white-top, chick-weed and purslane.

SEED IMPURITIES AS A SOURCE OF WEEDS.

Weed seeds are a frequent impurity in seeds of clover, alfalfa and grasses, as well as in hay and seed grain. The many weeds introduced in this manner give but a faint idea of the extent of these impurities. New weeds are introduced and old ones are scattered widely with the consequent damage to the purchaser. Seed oats may contain impurities like charlock, or spreading mustard, and prove a real damage when introduced upon a farm or in a community. In the case of seed grain the husbandman may choose to rely upon his own judgment as to whether injurious impurities are present, but he can certainly afford to "look sharp" at this seed rather than introduce weed pests that will remain to plague him for years to come. In the matter of impurities of clover seeds and alfalfa the published work of Hillman[1] in Nevada (Bulletins 38 and 47) and of this department of this Station in Bulletin 142, ought to be of some aid to the purchaser.

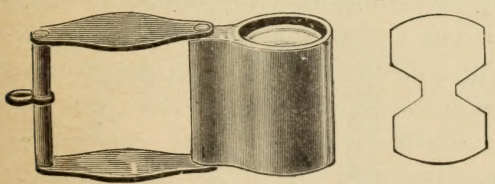

FIG. 1. Pocket Coddington and section of its lens, natural size.

The best lens for ordinary examinations.

The Doublet lens differs only in being cheaper, it is constructed with a separate lens at each end of tube.

[1]Nevada and Other Weed Seeds, B. 38, (1897.) Clover Seeds and Their Impurities, B. 47, (1900.)

Illustrations and lists of impurities of clover seeds and alfalfa are inserted in this edition of the weed manual. The published results of examination of samples will show the possibility of introducing new weed species in these seeds and also *the great danger from dodders, which are especially to be feared in alfalfa growing.* It seems possible for each grower to learn the commoner weed seeds and to be able on all occasions, and willing to recognize them. Seed dealers have an equal interest in the matter. They are commonly on the alert with respect to seed impurities and will cover the matter so far as demanded by their patrons. In the line of seed examinations the Botanical Department of the Station stands ready, as in the past, to render service if seed samples are submitted for examination.

In the matter of books, I believe we have no single work in English, aside from the bulletins mentioned, which illustrates, or describes, many weed seeds. The bulletins just referred to will serve the purpose, together with others, quite satisfactorily to most. Those who read German will find Nobbe's Samenkunde (Knowledge of Seeds) exceedingly useful. It treats of all questions pertaining to seeds, their structure, testing, impurities, and the detection of the latter. This work was published in Berlin by Wiegandt, Hempel & Parey, in 1876 but may still be obtained from the second-hand book stores. The English reader, familiar with botanical names, can make good use of the 339 woodcuts, chiefly "representing seeds of interest to us." Another and more recent German work, "Die Unkrautsamen (Weed Seeds) by Burchard is also published by the same publisher, Paul Parey. Burchard's work gives excellent illustrations of about 200 weed seeds in 5 plates. See also Bulletin 66, Kansas Experiment Station.

But aside from books, by investing in a few dozens of small glass bottles (vials) and labels, one can soon make a valuable and useful collection of seeds. The collection being done from known plants and the vials labeled accordingly, the seeds will be available for reference at all times. Collections of seeds may also be put up in sheets as suggested by Dr. B. D. Halsted. Heavy bristol board is perforated with a wad-cutter, then by pasting gummed paper or other bristol over the back, placing the seeds in the holes and covering, the whole with glass or each orifice by a small cover slip of thin glass or mica, the labeled samples will be so placed that seeds to be identified may be compared with them. We have found that if well gummed labels are used for the back these may be moistened again after putting on, and the seeds

will adhere firmly, being protected by the sides of the board. In such a case the holes need not be over half an inch or even less in diameter. The possibilities of seed collecting have been well demonstrated in more recent years by teachers and superintendents in their nature work in the rural schools. Some of the sets of weed seeds collected by students and put up in glass vials would do credit to advanced workers in this line.

Very generally a magnifying glass will be needed in addition to all other aids. Some of these are made more expressly for such work, but the grower or student will wish to purchase one that will meet various needs, such as the examination of parts of plants, fungus spots and insects. For this purpose the pocket Coddington lens, or pocket doublet lens, of one-half inch focus, is perhaps the best low-priced lens. It is shown in Fig. 1, and costs about one dollar and fifty cents for the Coddington, half-inch focus; the cost of the doublet lens is about one dollar. This is the most desirable size to purchase for general use.

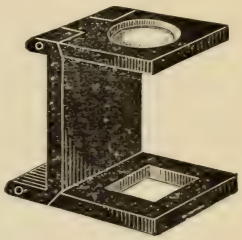

FIG. 2. Linen Tester, natural size. A good cheap magnifier.

The pocket lenses with fancy rubber and nickel frames, made up of one to three glasses, are not to be compared with it in effectiveness. The best, very cheap magnifier is the "linen tester," Fig. 2. It commonly sells at from thirty-five to forty cents for each lens, and will usually be more effective than the rubber-cased lenses just mentioned and will cost about one-half or one-third as much. The linen tester is not well suited to seed work. For seed merchants Fig. 3 shows a useful lens of about one inch focus mounted on tripod. It does not magnify sufficiently for many purposes but is good for rapid examination of a seed sample to separate impurities. The seed being placed upon a paper on a level table the glass is stood upon i It costs about fifty cents. An of these lenses may be purchased through opticians or jewelers o will be sent by the makers postage paid upon receipt of catalog price. The above cuts were furnished by the Bausch & Lomb Optical Co., of Rochester, N. Y., who are makers of such articles.

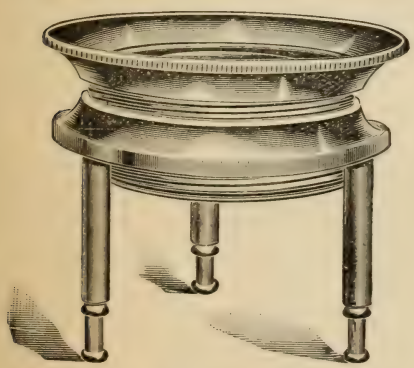

FIG. 3. Lens mounted on tripod, natural size. A good glass to examine seed for impurities; less desirable than the Pocket Coddington.

SEED INSPECTION.

Seeds should be inspected not only to determine their purity, but their vitality aswell. This is a serious matter to the vegetable grower, with whom the difference between strains of the same variety is often very great. With the celery farmer a supply of bad seed causes large losses. In any statute concerning weed-seed impurities, as in Sec. 7001 R. S. Ohio, there should be some authority designated to examine seed in order to make the law operative. If there has been a conviction under that statute in the many years since it was enacted, it has never been known to me. The U. S. Department of Agriculture is carrying on "pure seed investigations" through its seed division, and it would appear that the time approaches when the State will be required to provide for seed control similar to that maintained in some foreign countries. Meanwhile the small amount of examination made by the Botanical Department of the Experiment Station represents the demand for it. In this work there is opportunity to do a good deal more, should it be required.

In the matter of the conditions affecting the vitality of stored seeds, the recent work of Duvel[1] is of great value to all. He has shown that *moisture* is the chief factor in determining the longevity of seeds as commercially handled; seeds must be kept dry to remain viable.

WEED LEGISLATION.

Weed destruction or subjugation requires individual and collective or communal effort. This arises from the manner of seed dispersion. If one farm produces weeds and seeds in abundance, adjacent areas will be covered by them. Wares offered for sale may contain noxious seeds. The necessity for reasonable weed legislation is well established, but unfortunately there is room for much improvement in Ohio weed statutes.

There are now in force an act to prevent the vending of seeds containing seeds of certain weedy plants—Sec. 7001; a law providing for the destruction of weeds, briers and so forth, along partition fences—Sec. 4255 1-5 R. S., and two recent acts requiring the destruction of Canada and Russian thistles, wild lettuce and wild mustard. There appears to be no provision made for the destruction of weeds upon the property of the State, as along canals and about reservoirs. Under these circumstances much good may be accomplished by the enactment of an adequate and at the same time readily adjustable state weed law.

[1]The Vitality and Germination of Seeds by J. W. T. Duvel. Bulletin Bureau of Plant Industry. U. S. Dept. Agriculture, 58: pp. 96, (1904).

To be effective a weed law must be specific with respect to the weeds to be destroyed, while the dates assigned for work and the methods employed must be adapted to these plants. It must also be susceptible of change as to the plants named in it. This is made necessary by the constant introduction of new weeds. A weed law should, furthermore, impose weed destruction in such a manner as to lay the least burden, while at the same time fixing the responsibility upon the persons benefitted by it, namely, the persons using the land.

A weed law must further be operative. The careless user of land is often easy to offend. A definite officer may rightly be charged with the duty of supervision rather than to leave it to the complaint of a neighbor. It should be drawn so as to secure the cutting of weeds along the thoroughfares, whether public or corporate.[1] And lastly, it should expect the State to deal with its public works and lands as individual citizens are required to deal with each other on the weed question. Enactment of this character will proceed only from effective agitation by the persons interested.

DESCRIPTIVE ILLUSTRATED LIST OF OHIO WEEDS.

In the list here given, it has been the aim to give some of the more obvious characters of each weed and to present illustrations of such of the noxious or new ones as appear to require it. Information looking to the recognition of the plant has been first in mind. Seed characters are presented where possible. The best known methods of eradication or subjugation have been given in every case. Where plants have been classed as noxious upon insufficient grounds, correction is offered. In a few instances the uses of plants are stated. Parasites, with the exception of the dodders and broomrape, are omitted.

The plants are grouped according to a recognized plan among botanists.[2] Those of similar characters will thus be found in sequence under families or orders. Noting that individual plants, rather than groups, appeal to the ordinary weed observer, the matter of classification is not made prominent. Enough has been given to determine the order or family in every case, if the name is known. In mentioning the parts of plants the simplest accepted terms have been applied. One seeking to find the name of a plant may proceed in any one of the several ways. The indexes, the analytical key,

[1] Credit is due the railways for much greater care in the destruction of weeds along their rights-of-way in recent years.

[2] The systematic arrangement and technical nomenclature of Britton's Manual have been followed. This begins with the lower orders.

the resemblance to some plant illustrated or known, will assist according to the circumstances. The resemblance of a given plant to some one of a known family will aid greatly in the use of the indexes. The annual (A) biennial (B) and perennial (P) weeds are distinguished. The technical names of weeds introduced from beyond our borders are designated by an asterisk.(*)

DESCRIPTION AND ILLUSTRATION OF WEED SEEDS.

An effort has been made to describe and illustrate the weed seeds likely to be met with in commercial seeds and forage. The descriptions are given in popular language and with as much exactness as has seemed possible; in nearly all cases they were made from specimens, the remainder are based on Nobbe's illustrations. The descriptions will no doubt be found to be of unequal value and frequently quite inadequate. The only magnifier employed was a Coddington lens ½ inch focus, such as is illustrated in Fig. 1. A good deal has been accomplished in seed illustrations since the issue of the first manual in 1897. We have endeavored to profit by these contributions in the present issue. Where new cuts were made the illustration of seeds was included. The illustrations of weed seeds reproduced by photography are printed in plates at the back of the bulletin.

SOURCES OF INFORMATION.

The list is based upon the material accumulated from correspondence during the past ten years, including the many cordial responses to requests for lists of roadside weeds, and upon the results of personal investigations. The contributed roadside weed lists, given in the tables at the end of the former bulletin, are omitted in this issue. It has appeared best to base estimates of a goodly number of weeds quite largely on the known botanical characters of the plants in question. An occasional patch of toadflax or of bouncing-bet, or a cemetery over-run in parts with cypress spurge and periwinkle, commonly excites little apprehension until it is too late; the true characters of these plants and a host of others are not realized. Likewise the frequency of certain weed seeds in commercial seeds and hay may appear at times to be stated in strong terms; but these statements are based upon the results of examinations made at the Station. It may be admitted that correspondents are more likely to send impure seeds than clean seed without altering greatly the state of the question. The responsibility must finally be laid where it belongs.

ACKNOWLEDGMENTS.

I am under many obligations to correspondents throughout the state. The cordial assistance and the continued interest must be acknowledged as contributing largely to the nature and scope of the list.

Prof. E. E. Bogue, now of Michigan, and Mr. Wm. Krebs, of Cleveland, have contributed information concerning golden hawkweed; Mr. E. W. Vickers, of Ellsworth has sent valuable notes on tickseed sunflower with specimens; Mr. W. H. Aiken, College Hill, on Scotch thistle; and Bro. H. Jaske, of Dayton, now deceased, sent specimens of sandwort plantain. More recently I am indebted to E. W. Roush, of Lindsey, Sandusky county, for information regarding *Erysimum repandum* L. in oats, etc., and to Dr. Kellerman's State Catalogue and Supplement for occurrence of plants. Many others whose names are not given have rendered valuable assistance.

Of the illustrations Nos. 1, 2 and 3 were supplied by the Bausch & Lomb Optical Co., of Rochester, N. Y.; Nos. 4, 5, 6, 7, 8, 9, 11, 16, 22, 23, 25, 26, 32, 36, 38, 41, 44, 47, 65 and 69 were reduced from plates published in Dr. Vasey's Reports as Botanist of U. S. Dept. of Agriculture. Nos. 10, 13, 14, 17, 21, 29, 34, 39, 42, 45, 52, 57, 60, 61, 62, 63, 64, 67, 68, 70 and 73 are from Dr. Millspaugh's Bulletin 23 of the West Virginia Experiment Station, kindly granted by the late Dr. Jno. A. Myers, Director of the West Virginia Experiment Station; Nos. 40, 51 and 55 are from electros supplied by the U. S. Dept. of Agriculture. No. 71 is a cut drawn by Miss Detmers. The remainder are from original drawings made for the Station. Of these latter No. 24 is by Miss Vinnie Cunningham, No. 66 by Miss C. Durstine and twenty-three others are by my wife. I desire to express my obligations to all these persons for the favors granted and assistance received.

NOTE.—I have inquiries asking me to recommend books on botany for self instruction, or for use on the farm. These more commonly seek to find books teaching the names of plants with statement of characters. Upon this branch, Systematic Botany, there are several good works:

1. *Britton and Brown's Illustrated Flora of the Northern States and Canada*, 3 vols., each $3.00. Charles Scribner's Sons, New York. Each species is illustrated and described. This is a work to be recommended for the libraries of horticultural societies, granges and farmers' clubs. It is useful to all students of botany.

2. *Britton's Manual of the Northern United States and Canada*, 1 vol. $2.00, Henry Holt & Co., New York. This a compact book of 1080 pages and gives the revised nomenclature of recent use.

3. *Gray's Manual of Botany*, (6th edition). 1 vol. $1.80, American Book Co., New York, Cincinnati, etc. A standard work on the botany of the northern states.

4. *Gray's Revised Lessons in Botany*, American Book Co. is an elementary treatise on botany, but gives no names of plants—simply elements to prepare for that.

5. *Gray's Field Book of Botany*, Revised by Bailey, 1 vol., $2.00. Commonly bound with the lessons. American Book Co., Cincinnati. This book will be found the most helpful to those dealing with cultivated plants. The wild plants are not all included.

I PTERIDOPHYTES.

Plants reproduced from spores by means of a prothallus.

FERN FAMILY.

1 Brake Fern (P) *Pteris aquilina* L. The brake or eagle fern often infests partly tamed, sandy soils and chokes out grasses. Its tall, 2 to 5 ft. fronds (leaves) are much parted, while the young sprouts are coiled like a shepherd's crook. The sprouts are used as pot-herbs. Clearing up, plowing and manuring the land will make it possible to seed to grass.

2 Sensitive Fern (P) *Onoclea sensibilis* L. The leaf-like (sterile) and fruit-like (fertile) fronds of this fern appear together in moist meadows and on the borders of thickets. It is dealt with by drainage and tillage.

3 Cinnamon Fern (P) *Osmunda cinnamomea* L. This fern is often found in swampy places and near springs and brooklets. Its fronds are very tall, 3 to 5 ft. high, and have the stalks covered with rusty wool. It may be destroyed by draining the soil and grubbing out the rootstocks.

4 Flowering Fern (P) *Osmunda Claytoniana* L. Much like the last but differing in having an open interval about the middle of the frond; to be dealt with in the same manner.

HORSETAIL FAMILY, EQUISETACEÆ.

5 Horsetail (P) *Equisetum arvense* L. The common horsetail is met with upon moist road embankments and in wet grass lands. In the early season many small, pale, arrow-like stalks with yellowish heads make their appearance; these are followed by feathery, tail-like, leafy, green shoots. These plants are merely symptomatic and indicate lack of drainage. The lack supplied, cultivation will dispose of the horsetail.

II SPERMATOPHYTES.

Plants reproduced from seeds.

1 GYMNOSPERMÆ

Ovules naked.

PINE FAMILY, PINACEÆ.

6 Pines, *Pinus* spp. Pines are as yet rarely spreading within our borders, as is so well marked in other states. That such may become much more general is to be expected. Many causes may make such spread rapid and aggressive.

7 Hemlock, *Tsuga Canadensis* (L.) Carr. Hemlock is known to the writer to be freely spreading on certain light soils in Wayne county. With both pines and hemlock, grubbing will effect removal.

2 ANGIOSPERMÆ

Seeds enclosed.

1 MONOCOTYLEDONES.

Plants with but one seed-leaf (cotyledon) and leaves parallel-veined.

CATTAIL FAMILY, TYPHACEÆ.

8 Cattail (P) *Typha latifolia* L. The cattail is a frequent obstruction in ditches and moist places.

BURREED FAMILY, SPARGANIACEÆ.

9 Burreed (P) *Sparganium eurycarpum* Engelm. Like the cattail the burreed is frequent in wet places and may be much in the way. Such aquatic plants are subjugated when the excess of water is removed by drainage.

PONDWEED FAMILY, NAIADACEÆ.

10 Floating Pondweed (P) *Potamogeton natans* L. This species and others of the genus occur in canals and reservoirs. When growing abundantly in canals such plants are an obstruction to navigation.

WATER-PLANTAIN FAMILY, ALISMACEÆ.

11 Common Water-plantain (P) *Alisma plantago-aquatica* L. The water-plantain occurs about the borders of watering ponds or in depressed grass areas covered with water a portion of the year.

12 Arrowhead (P) *Sagittaria latifolia* Willd. This common arrowhead, and at times some others not readily separated from it, are found in wet places or in water. They are chiefly objectionable because of the harbors afforded by them. Muskrats live to a considerable extent upon the roots of these and other aquatic plants. The reduction of wet areas to the smallest amount will be a profitable preventive.

GRASS FAMILY, GRAMINEÆ.

13 Johnson-grass (P) *Sorghum Halepense* (L.) Pers. Among the forage plants which are capable of doing much harm, we must include Jonhson-grass. It has strong, creeping root-stocks and like quack-grass will spread by means of them. Unless one is ready to give the land up to this grass, the seeding of it should not be undertaken. The seeds do not as yet appear to have become intermixed with other grasses at the north. Spillman[1] has worked out methods of eradication by cultivation.

14 Big Blue-stem (P) *Andropogon furcatus* Muhl. This is a tall, finger-spiked, beard-grass distributed in dry or sterile soil over central and northern Ohio; it grows 3 to 4 ft. high. In the early season it makes a dense, tufted growth, when it is readily eaten by stock. After blossoming the stems are hard and woody. It is apparently not to be feared as an intruder.

15 Broom-sedge (P) *Andropogon Virginicus* L. Broom-sedge, Fig. 4, is a weedy grass that has moved to the northward. Native and abundant in the south, and apparently in the southern counties, it has latterly spread over much of Ohio not originally infested by it. It grows in dense tufts, 3 to 5 feet high, its early light green and later brown color being in contrast with the other grasses. In the fall its plumed hairs are conspicuous. It is limited in weedy development to the dry, sandy soils of the state. In this respect it is like sorrel, but, unlike the latter, it does not seem to be controlled by enriching the soil. The sandy up lands of the coal measure districts appear to be the worst infested with broom-sedge. That part of the state lying east of a line drawn from Cleveland to the mouth of the Scioto river, marks the district in a general way, but the weed has not yet reached the northern counties of this section. Sandy soils predominate in a wide belt just west of the line named, especially where the native rocks are not covered by the drift. And in this belt, likewise, as well as in the district just named and in other sandy soils, the broom-sedge may ultimately appear. A warning is here given to grub out the first bunches. I very well remember the first appearance of broom-sedge in northeastern Athens county in the early seventies. It has now invaded much of that county, while in Meigs, Jackson, Vinton and Lawrence counties it is a veritable pest.

FIG. 4. Broom-sedge.

[1]Bulletin Bureau Plant Industry, 72: 15-22: 1905.

Seeds straw color, oat-like, 1-8 inch long, with 3-8 to 1-2 inch awn at tip; tufts and plume of fine hair at base. The seeds are supported by the plumes of attached hairs and thus they are widely scattered by the wind.

In destroying broom-sedge we must deal with both the seeds, which mature as early as September and perhaps earlier, and with the dense matted roots as well. The seeds may be destroyed by burning the land over, the roots by tilling the ground. Indeed there are localities in which permanency in valuable grasses is rendered difficult by broom-sedge. Short rotations with clover are not in general use in these lands, and may prove a most valuable means of subduing the pest.

16 Little Blue-stem, *Andropogon scoparius* Michx., another grass like above, occurs locally in dry soil. It is much less prevalent than the one figured and it may be dealt with in the same manner.

17 Field Paspalum (P) *Paspalum laeve* Michx. Much resembles crab-grass in respect to the finger-like, though much broader, spikes. In paspalum, however, the spikes are alternately arranged on the culm, are 2 to 6 in number and the seeds are borne in two wide, smooth rows. The plant is scarcely weedy with us, although occasionally received as such.

Seeds approaching circular in outline, smooth, flat on one side and swollen on the other, 1-10 inch long.

18 Barnyard-Grass, Cocksfoot (A) **Echinochloa Crus-galli* (L.) Beauv. This is a smooth-stemmed, leafy, coarse-growing grass, 1 to 4 ft. high. Its one-sided spikelets and awned glumes have suggested the name of cocksfoot. It is abundant around barnyards and upon enriched cultivated lands. It is also common in low bottom lands following a crop that has been "laid by" early. This grass, because of its rapid growth late in summer, has been recommended to grow for forage like millet. It will certainly make fair yields treated in this way and proved usefulness may remove it from the weed list.

Seeds, straw-color to brown, flat on one side rounded on the other, 1-8 inch long, three-fifths as broad with short awn tip, very smooth and shining. Frequent in clover, alfalfa and millet seeds.

This and the next succeeding grasses are late growths in "laid by" crops, also in many other places. To destroy them the prevention of seed ripening is all essential.

19 Old-witch Grass (A) *Panicum capillare* L. This weedy panic-grass is found over the state, preferring dry soils. The spreading "tickle," plume-like tops (panicles) break off in the fall and are blown into fence-rows.

The seeds are straw-color, very small, 1-16 in. long, one-third as wide, smooth and shining. They occur frequently in clover and other seeds. Old-witch grass is an annual and must be prevented from maturing seeds by cutting and removal or burning, if it is gotten rid of.

20 Millet (A) **Panicum miliaceum* L. This well-known plant with its shining seeds is one of the panic grasses, and comes to us frequently in the form of seed impurities in grains and in the seeds of clover plants. Seeds, oval, about 1-10 inch long, smooth and shining, somewhat rarely hulled. It is mentioned here by reason of the frequent occurrence of the seeds in samples presented for examination.

21 Sprouting Crab-grass (A) *Panicum proliferum* Lam. The sprouting crab-grass is very much branched. The anthers are a characteristic saffron yellow. The spreading growth contrasts with the others. It springs up along stream borders, sidewalks and in grassy yards, often with crab-grass. It is a decided weed, to be dealt with as the next.

22 Crab-grass (A) *Syntherisma sanguinalis* (L.) Dulac. To one who cares for a large, much trodden-down lawn or a tasty garden, crab-grass makes good mid-summer rains almost a burden; following these showers it springs up in nearly all early grass tracts, in gardens, meadows and cultivated fields. Its stems strike root where they touch the earth and most careful labor is required to clean it out. Withal it is highly nutritious, and often furnishes one or two crops of hay in southern (Tennessee) grainfields. In Ohio it ranks as a pest so far as known to the writer. It is also called Polish millet. Fig. 5 shows the appearance of the weed.

FIG. 5. Crab-grass.

Seeds straw-color, 1-10 in. long, like old-witch grass but longer and more pointed. (See seed figures.)

Thorough, late tillage to destroy all plants and seeds will be required to get rid of this weed.

23 Slender Finger-grass (A) *Syntherisma filiformis* (L.) Nash, and **24 Small Crab-grass** (A) **Syntherisma linearis* (Krock) Nash, more especially the latter, are species closely related to crab-grass that may be met with. For practical purposes their possible confusion with the common weedy species will not be a matter of importance at the same time that the critical student will wish to distinguish them.

25 Foxtail, Pigeon-grass (A) **Chaetochloa glauca* (L.) Scribn. The common or yellow foxtail with dense, spiked heads like millet, is everywhere known. I comes in cultivated fields after crops are laid by, in stubble, in lawns, meadows and in pastures. It also springs up where any vacant space is left in the oat fields, as between plots of Station work. The bristles in the dense heads are upwardly barbed.

Seeds flattened on one side, 1-8 inch long and more than half as wide, straw-color to dark brown, with dense, transverse wrinkles all over them. Very common in clover seed, millet and seeds of late grasses. (See seed cuts.)

Late cultivation, cutting, burning or other seed destruction is required in subduing this grass. Its seeds are evidently stored in most cultivated soils. This weed is attacked by a smut, *Ustilago panici-glauci* (Wallr.) Wint., which destroyed the seeds to a measurable extent about the Station in 1896-1897; this smut does not attack grains.

26 Green Foxtail, Bottle-grass (A) **Chaetochloa viridis* (L.) Scribn. Resembles the common yellow foxtail, but has a green head and usually green bristles. The heads are more tapering towards the tip. Occurring in rich, cultivated fields.

Seeds, 1-16 inch long, resembling the last but with slightly different markings. (See seed cuts.) This grass should be destroyed like the common foxtail.

27 Foxtail-grass (A) **Chaetochloa verticillata* (L.) Scribn. This, the third o the prevalent foxtail grasses is distinguished from green foxtail by the upward barbing of the bristles. The seeds are large like those of the latter species, partly light-colored and partly dark, about 1-16 inch long, with indistinct markings as shown in the illustration in the seed cuts. This is to be dealt with in the same manner as the other species.

28 Italian Millet, Hungarian-grass (A) **Chaetochloa Italica* (L.) Scribn. Hungarian grass is frequently cultivated in our area and is even more frequently an impurity in various seeds. While less prevalent and troublesome than the common, yellow foxtail it is often regarded as a weed, and frequent inquiries arise for this reason. Seeds about the same size as green foxtail—about 1-16 inch long—smooth or but slightly marked, varying in color, often coming with entire hull removed.

29 Bur-grass, Sand-bur (A) *Cenchrus tribuloides* L. This vile weed is illustrated in Fig. 6. It is of itself sufficiently illustrated for those who have been in close contact with it. The stems are branched, about 1 foot high, and the spikes are well armed. The one characteristic feature is the many pointed, rigid bur enclosing the seeds; this drops or is detached and carries the seed with it. Bur-grass appears to be scattered over the entire state in sandy soils. It is found to be a most pernicious weed. Along the shores of Lake Erie I have noticed it frequently. The spines are very hard and stiff. It is worse than cockle-bur or bur-dock in its penetrating powers.

Fire and hand gathering should go together in destroying it. Waste, sandy areas harboring it should be burned over annually.

FIG. 6. Bur-grass.

30 Reed Canary-grass (P) *Phalaris arundinacea* L. Is a tall perennial with culms 3 to 5 feet in height and with somewhat copious leaves, often 3-5 inch n width and almost a foot in length. It is characterized by a dense continuous ipanicle which turns light in color, and by the production of abundant rootstocks under ground. It is a native of rather marshy land and sometimes complaints reach us by reason of its persistence in such soil. The cultivated ribbon grass is a variety of this species. The Reed canary-grass may prove profitable for cultivation owing to its productiveness although the production of viable seed is quite uncertain. The seeds vary from lighter to darker, are elongated and taper to point above, often downy and hairy above, while smooth and shining at the base, about 1-8 inch in length.

31 Canary-grass (A) **Phalaris Canariensis* L. This grass, which in its native home produces bird seed, the common food of canary birds, is distinguished by a short, dense, oval spike. The scales upon the outside are often whitish with conspicuous green faces. Its seeds frequently appear as an impurity in other seeds; they are elongated, pointed, about 1-6 inch long, smooth and shining. Mentioned herein because of the common occurrence of the seeds in commercial products. Not to be feared as a weed.

32 Poverty-grass, Tripleawned-grass (P) *Aristida dichotoma* Michx. This species, with other awned ones of the same genus, is occasionally met with in borders and grass lands, especially in dry soil. The two erect and one divergent awn at the tip of the grain sufficiently characterize these grasses for common recognition. They occur somewhat infrequently but often attract interest by reason of the characteristic awns. Like wild oat-grass it is best controlled by improving soil conditions.

33 Porcupine-grass (P) *Stipa spartea* Trin. This grows to the height of 2 to 4 feet and has an upright, smooth culm. It is not frequently, though occasionally met with in our area. It is characterized by a long, stout, spiral awn, usually twice bent, hence the illusion in the common name. Certain to attract notice where persisting and capable of being annoying as a weed.

34 Nimble Will, Dropseed-grass (P) *Muhlenbergia diffusa* Willd. Nimble will, Fig. 7, is a low, much branched, weedy grass with wiry culms (stems) 1 to 2 feet long, also called wire-grass. It is common on dry hillsides and along pathways. Seeds slender and inconspicuous.

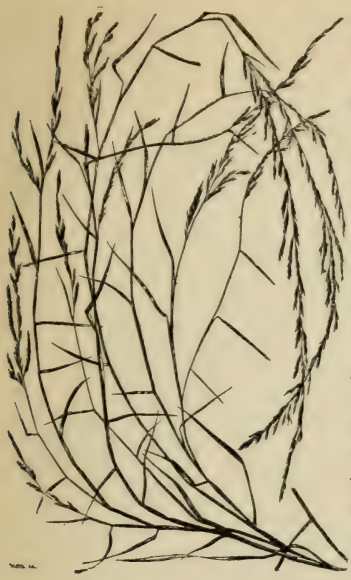

FIG. 7. Nimble Will.

Cultivation and rotation with clover may be successfully used in dealing with this grass.

35 Mexican Drop-seed, Wood-grass (P) *Muhlenbergia Mexicana* (L.) Trin. This grass is a much-branched perennial growing in damp ground, especially in woodlands. It is of no agricultural value and is frequently received for name. While resembling the last it has lateral and more compact panicles. Cultivation and drainage will displace it.

36 Rush Cattail-grass (P) **Heleochloa schoenoides* (L.) Host. This is a low, perennial grass with decumbent base and attracting attention by the short, dense panicles, very much resembling, at first glance, those of the cultivated timothy. The plant is sparingly naturalized at various points in the state and is likely to attract increased notice. How objectionable it may prove experience will show.

37 Wild Oat (A) **Avena fatua* L. Wild oat, Fig. 8. has been introduced at two points or more in the state, and should be destroyed promptly wherever found. It has become very troublesome from Minnesota to Oregon and elsewhere westward. It may be looked for in oats or forage and some other western seeds.

FIG. 8. Wild Oat.

Seed grains, usually larger than cultivated oat, ripening earlier and irregularly, each floret falling as soon as ripe, the lower with long, stout, twisted and bent awns. The floral glume about the grain is hairy below the middle, nearly black at maturity.

Gathering and burning the plants before the seeds ripen is the method of destruction now needed.

38 Wild Oat-grass, Poverty-grass (P) *Danthonia spicata* (L.) Beauv. Dry, sterile banks, or hard, but poorly seeded, infertile grass lands are covered in early summer by this light green, tufted grass. The leaves are short and narrow, usually rolled. The stems (culms) are slender, 10 to 20 inches high, with few seeds. After flowering, the leaves and stems dry up and give a desolate appearance. It is rightly named "poverty-grass," indicating an impoverished condition. Manuring, rotation with clover and reseeding will soon rid the land of this grass by causing a better growth in its stead.

39 Bermuda-grass (P) **Capriola Dactylon* (L.) Kuntze. Also called dog's tooth grass. This low grass spreads from long, creeping and branching stolons and grows to a height of from 6 inches to 1 foot. It has short leaves and propagates itself so rapidly that it is very intrusive and objectionable. While locally cultivated in the south for pasture it is becoming established at some points in Ohio, and from its nature is likely to give serious inconvenience in lawns, and especially in cultivated grounds. Only careful attention will succeed in eradicating it where once established. Distinguished by the four-to five-finger spikes of the head, which are shorter and much thicker than ordinary crab-grass. The seeds at the north not frequent as an impurity although may possibly become so; enclosed in glume, about 1-8 inch long with groove on one side.

40 Stinking-grass, Pungent Meadow-grass (A) **Eragrostis major* Host. Stinking-grass, Fig. 9, is another of the weedy annual grasses. It is quite showy and may be readily recognized from the peculiar form of the panicles (heads). It grows in cultivated or waste grounds and in yards. When fresh it emits a strong, unpleasant odor.

Seeds very small, nearly round, of a light reddish color, without adherent glumes. Frequent in timothy seed.

To destroy this weed it must be prevented from seeding, either by uprooting or by late cultivation.

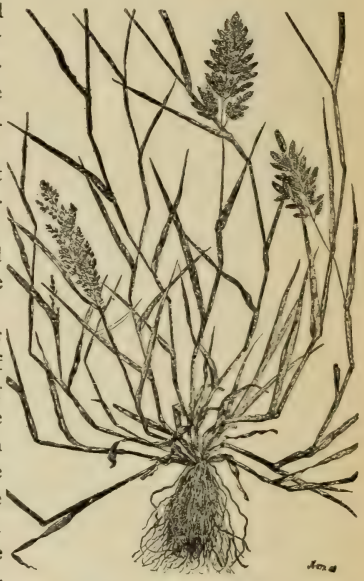

FIG. 9. Stinking-grass.

41 Low Meadow-grass (A) **Eragrostis Eragrostis* (L.) Karst. This second species of meadow-grass is much lower than the preceding which in a way it resembles. The stems are seldom much more than 1 foot in length with decumbent and much-branched bases. The sheaths are loose and sparingly hairy and the leaves are short; liable to become quite general in time, and to persist like the preceding. The seeds are small, resembling those of stinking-grass. Should be eliminated, if at all, by cultivation.

42 Frank's Meadow-grass (A) *Eragrostis Frankii* Steud. This is a low much-branched and spreading grass resembling the preceding. It is a native species and tends to multiply on low, or sandy ground. To be handled like the other species.

43 Crowfoot, Dog's-tail Grass (A) **Eleusine Indica* (L.) Gærtn. Crowfoot, a two-to-five fingered grass, grows to a height of a foot or more and is prevalent in walks and yards. The spikes are thicker than those of crab-grass and the whole growth is sturdier. It should be taken out with a hoe before seeding.

44 Tall Red-top (P) *Tricuspis sesterioides* (Michx.) Torr. This is a tufted grass with its tall culms, 2 to 5 feet high; the purplish heads are quite conspicuous, especially through the southeastern part of the state. It has recently been complained of as intruding in grass areas, in that region. Sometimes these are borders, sometimes meadows. Once recognized by its manner of growth and purplish panicle, reaching a foot or more in length, it is not easily forgotten. While perennial, it is probably less troublesome and objectionable than orchard grass, though more inclined to intrude in swampy areas. Seeds not large, 1-16 inch long; the plant is scarcely to be feared as a weed but should be controlled by mowing.

45 Wire-grass, Flat-stemmed Blue-grass, (P) **Poa compressa* L. While of much more value than most of the preceding, this grass, by its creeping rootstocks, tends to crowd out more valuable sorts. In the light soils of southeastern Ohio this is generally the case. In mowing, the flat stems are very hard to cut and this leads to the name of wire-grass; it is also called Canada blue-grass. Upon thin, light soils, where no other grasses can be grown successfully, it will yield rather scant herbage.

Seeds like Kentucky blue-grass but less downy. Cultivation for one or more years in some summer crop is necessary to kill out wire-grass satisfactorily. This result is not secured by taking a single crop of wheat and reseeding.

46 May-grass, Low Spear-grass (A) **Poa annua* L. This is a low grass scarcely reaching a foot in height, growing from seed each year. It strikingly resembles blue-grass except in the height, the more compact form of the panicle and its early heading out. Very many specimens have been sent the season of 1905 for identification, commonly by those who thought it might prove useful as a lawn grass, which it cannot from its annual nature. The writer looks upon it as an incumbrance in lawns, which may be mastered, except for the occasional wet seasons. The seeds are larger than those of wire-grass, about 3-16 inch long, with sparing woolly-hairiness and of appearance shown in the weed seed illustrations. See plates of seed cuts.

47 Chess, Cheat (A) **Bromus secalinus* L. Chess needs no description and no apology for including it in a list of weeds. It is a winter annual. From the fact that it frequently comes in wheat where clean seed has been sown, the notion that wheat turns to chess has gained prevalence. But the chess plant springs from chess seed as certainly as wheat springs from wheat seed. The seeds, however, appear to retain their vitality for a long time and the presence of such seeds in the soil will account for its appearance under some circumstances. The vitality of buried seeds has been already discussed.

Seeds slender 5-16 to 3-8 in. long, with adhering glumes. Occasionally found in wheat, in oats and in clover seed. Distinguished from oats by darker color and smaller size of grain.

Chess, like wheat, dies after seeding. To prevent seed from ripening and to avoid sowing chess in other seeds is the remedy. It may be pulled out of the grain fields when present in limited amount. Ground may be freed from buried seeds by thorough, continuous cultivation.

Fig. 10. Perennial Rye-grass. (*After Millspaugh.*)

48 Soft Chess (A) **Bromus hordeaceus* L. This chess-grass is distinguished from the common cheat by its soft-hairy character and commonly shorter culms. It is less likely to be introduced than cheat but is frequently met with, and for that reason must be distinguished from the commoner species.

49 Slender Chess (A) **Bromus tectorum* L. Slender chess is occasionally found in different parts of the state. It is gradually becoming introduced. The whole plant is lax, the panicles somewhat one-sided and covered with fine down. It should be destroyed in the same manner as cheat.

50 Perennial Rye-grass, Darnel, (P) **Lolium perenne* L. The seeds of the common darnel, Fig. 10, are sometimes sent out for meadow fescue, *Festuca elatior* L., which they closely resemble. It is also spontaneous quite generally. In moist climates it is a reliable pasture grass for strong soils. While not ranking as a noxious weed it is here included that it may be distinguished from more valuable grasses.

51 Quack-grass, Couch-grass, Wheat-grass (P) **Agropyron repens* **L.** Quack-grass, Fig. 11, ranks among the very worst weeds and is found locally in most counties. This grass grows 1 to 3 ft. high, from an extended, creeping, jointed rootstock, bearing spikes 3 to 10 inches long. The rootstocks are of the same character as those found in Johnson-grass and render this one of the most difficult plants to eradicate. A correspondent writes that the rootstocks in his field grew through potato tubers.

Fig. 11. Quack-grass.

Seeds slender, 3-8 to 1-2 in. long, the enclosing glume apparently three pointed. It is not yet prevalent in the seeds of commerce.

From what has been already said, it may be inferred that quack-grass is very difficult to destroy and that unless eradicated when found it will, in time, spread indefinitely. Not only must seeding be prevented but the creeping rootstocks must be starved out and destroyed. The method to be employed will be determined somewhat by the other circumstances. Where there are small areas containing it, they should not be cultivated with the surrounding land. A small area may sometimes be smothered out by covering tightly with boards. Hoe cutting and salting at frequent intervals will be found effective. This is especially useful when the pest occurs in land pastured by sheep or cattle. In any case two or three years will be required to eradicate it and frequently a longer time. When large tracts are infested, fences and other harbors should be removed and the whole carefully cultivated for a few years in some hoed crop.

52 Spelt (A) **Triticum spelta* **L.** Spelt is like wheat in general character; it differs in the strong tendency of the glumes to adhere to the grain, and in some other characters.

Complaint reaches us from Michigan, that spelt is becoming a menace to wheat growing, since once admixed in the wheat, it can scarcely be separated and the spelt spoils wheat for flour. The Michigan conditions should be sufficient warning to others to eliminate spelt by avoidance.

53 Squirreltail-grass (A or B) **Hordeum jubatum* **L.** This weedy grass, Fig. 12, seems capable of invading many parts of Ohio. It has come from the west and has been established in several places, particularly is it noticeable about Castalia, Erie Co., and near Toledo. It may spread to many districts not yet infested. The plant is usually 1 ft. high with a dense head two inches or more in length. The long awns and slender, sterile glumes give these so characteristic a look that one can scarcely be mistaken in the plant. It is related to barley.

Fig. 12. Squirreltail-grass

Seeds, when stripped of glumes, much like rye in appearance, 1-8 inch long. Squirreltail-grass should be gathered and burned wherever it is found. If this is practiced it may be prevented from becoming a general pest.

SEDGE FAMILY, CYPERACEÆ.

54 Galingale (**A and P**) *Cyperus diandrus* Torr., *Cyperus strigosus* L. There are several species of this genus, Fig. 13, growing in low wet ground and in ditches. They have grass-like leaves and at the top, clusters of flattened, chess-like fruits, borne on cylindrical or triangular stems. The second one has corm-like tubers about the base, which distinguishes it from the next.

FIG. 13. Galingale. (*After Millspaugh.*)

First of all to be rid of them, the land must be underdrained and then thorough tillage is required to destroy the plants where they have become fully established.

55 Nutgrass, Chufa (**P**) *Cyperus esculentus* L. The nutgrass of Ohio is a species of galingale, Cyperus, and is not identical with that of the Atlantic and Gulf states, which is *Cyperus rotundus* L., an introduced weed. In character ours is a troublesome weed, very difficult to eradicate. Unlike the introduced pest, this produces few seeds and propagates itself chiefly by means of underground stems, bearing small, pear-shaped tubers 1-2 in. in length, at intervals of a few inches. Stems are sent up to the surface at like intervals. Nutgrass is limited to lands originally suited to it, namely, those that were low and quite wet. But upon draining these lands it is very difficult to eliminate the plant. Some lands of this sort that have been in cultivation for many years are far from rid of it. Like Canada thistle and quack-grass, the stems and tubers underground must be starved out. To secure this, clean hoe cultivation for two or more seasons will be required; even this may prove ineffectual if infested fence rows are left uncleaned.

56 Sedges (**P**) *Carex* spp. The sedges are numerous. Fig. 14 shows their grass-like appearance. The leaves are frequently lighter colored than the grasses, and the rough culms (stems) are mostly triangular. The sedges that intrude upon the cultivator are plants of wet soil which can only be disposed of after drainage and by subsequent thorough culture. When present they show that the ground is not in condition to yield right returns, without draining.

FIG. 11. Sedge. (*After Millspaugh.*)

RUSH FAMILY, JUNCACEÆ.

57 Slender Rush (**P**) *Juncus tenuis* Willd. The slender rush, sometimes called poverty-grass, has round, pithy, unbranched stems, 8 to 18 inches high, and seed pods at the summit. It grows in over-moist soil like many of the preceding, and in trodden paths, but may often be cleaned out through cultivation. More drainage is the indicated need, where it occurs. The plant has little or no feeding value. It is properly not a grass.

58 Soft Rush (**P**) *Juncus effusus* L. A taller rush, growing 2 to 3 ft. high, is often met with in the depressions of pastures and in hollows. This soft rush is less frequent than the last and should be treated in the same way.

LILY FAMILY, LILIACEÆ.

59 Day-lily (P) **Hemerocallis fulva* L. The common, orange-colored, day-lily often escapes from cultivation, especially about old house-sites and on roadsides. The roots are very tenacious and only stringent measures will destroy them. Hoe cutting and salting, as recommended for Canada thistle, should prove efficient here. The plant does not deserve a place in culture. It spreads generally from the root.

60 Wild Onion, Wild Garlic (A and B) **Allium vineale* L. The wild onion, Fig. 15; is a bulbous plant and for that reason liable to be scattered widely. It grows from 1 to 3 ft. high and the floral umbel is often densely bulb-bearing, like the old garden onion, a feature not shown in the cut. A bulblet is figured at *a*. These bulbs or bulblets must be destroyed if wild onion is eradicated. If cows eat of this vile weed, the milk and butter are ruined. When the bulblets get into the wheat, as may often happen, the flour is likewise spoiled. This weed has been introduced from Europe and is established at several Ohio stations. While always bad it seems to flourish rather better on sandy or loamy soils. It seems to be planted occasionally and thence escapes, and also to be sown in wheat at times, especially in the south.

FIG. 15. Wild Onion.

A case of the latter sort occurred in this county. Scattered plants may be taken out and destroyed, but in badly infested lands it will be necessary to cultivate thoroughly in some hoed crop for at least two seasons. I have never seen it produce true seeds, but the bulblets, Fig. 15, *a*, possess great vitality. These may be removed from grain by drying thoroughly as proposed by Duvel.

61 Meadow Garlic (A and B) *Allium Canadense* L. The meadow garlic just named, as well as the wild leak, *Allium tricoccum*, both closely allied to the preceding, are sometimes found in borders and in meadows. These species seem to multiply more rapidly than the wild garlic and yet may prove pestiferous. Recognized by their bulbous character, and by their blossoms, resembling those of the onion. If necessary either may be removed in a manner like the preceding.

62 Star of Bethlehem (B) **Ornithogalum umbellatum* L. This is a common bulbous plant cultivated for ornament, which frequently escapes to the field. The scape, or stalk, is a foot high, or less, with narrow leaves and umbel-like clusters of greenish flowers with white margins. As a rule, even where escaped, the Star of Bethlehem is not objectionable. Should it prove so in any case the bulbs may be removed and the plant thereby evicted.

63 Adam's Needle (P) **Yucca filamentosa* L. This plant, while a favorite in cultivation, is capable of spreading greatly if permitted to ripen seed. The tall scapes (flower-stalks) with many creamy flowers are handsome, but if the plant is grown, it should not be permitted to produce seed. Once scattered, only laborious hand digging or cultivation will destroy the large-rooted seedlings.

64 Asparagus (P) **Asparagus officinalis* L. The wild asparagus does not differ essentially from the cultivated sort. This illustrates the danger of permitting plants escaped from cultivation to grow anywhere. The asparagus beetle, *Crioceris asparagi* has first been found by the Station Entomologist in any given locality, on these isolated plants; thence it has spread to gardens. The asparagus rust, *Puccinia Asparagi* DC., a most destructive disease of this plant, has already appeared in Ohio, and while it is more likely to be introduced in cultivated areas, the rust will certainly be harbored by any escaped plants. Persistent culture with hoe and, perhaps, the addition of salt, will destroy the strays.

GREENBRIER FAMILY, SMILACEÆ.

65 Greenbrier (P) *Smilax rotundifolia* L. Greenbriers of one or two additional species besides that above named, are found in fence rows and thicket borders. They may be killed by grubbing and putting the land in cultivated crops.

II DICOTYLEDONES.

Plants with two seed-leaves (cotyledons) and leaves netted-veined.

WILLOW FAMILY, SALICACEÆ.

66 Willows (P) *Salix* spp. That very persistence in growth which renders willows so valuable in protecting embankments and closings the mouths of abandoned waterways, makes them obstructive pests along streams generally. Frequent cutting or grubbing is resorted to. After the willows have become large enough to "peel" the bark from the trunk near the ground, this method of destruction is often succesfully practiced. This seems best done during June, when the bark is most easily separated. I have seen willows thus treated completely killed out, and the stumps rotting afterwards with little or no sprouting.

67 Cottonwoods, Poplars (P) *Populus* spp. The various sorts of poplar are often a serious annoyance in lawns. The white, or silver poplar, *Populus alba* L., sprouts prodigiously, and the same is true of the Lombardy poplar, *Populus dilatata* L. The commoner cottonwood planted for shade has likewise proved a troublesome neighbor by reason of its free sprouting. The frequent grubbing of sprouts is about all that can be done, and will prove effective if often enough repeated.

WALNUT AND HICKORY FAMILY, JUGLANDACEÆ.

68 Hickories (P) *Hicoria* spp. Sprouting hickories are one of the greatest pests of the sandy, hillside pastures of southern and southeastern Ohio. Unless frequently grubbed over, the quality and yield of herbage are affected. On such lands plowing is dangerous because of disastrous washing. The most that can be done seems to be to grub out, cut off or peel the bushes at intervals. With these as with other plants, the maximum shock will be given to the plant if cut off or grubbed at the time growth is about to cease and food storage increase. This will commonly occur in June and July.

MULBERRY FAMILY, MORACEAÆ.

69 Osage Orange (P) *Toxylon pomiferum* Raf. This is the common osage hedge plant from the southwest and often planted for hedges. The leaves are ovate and frequently pointed, smooth and glossy. The flowers are of two sorts and the fruit, a large apple-like affair, contains a large number of seeds. The plant is freely multiplied by cuttings and appears to branch freely from the root, especially where this is broken. It is a conspicuous annoyance in many portions of Ohio where it has heen planted for hedges and neglected, interfering not only with the appearance of the roadway but with the productiveness of the fields by which the early hedges grew. It is not improbable that becoming a pest in border areas, it may, in a few generations, become a persistent border plant, rendering the woodlots a source of annoyance thereby. It may be eradicated by cutting off the tops and burning brush upon stumps and by subsequent attention and removal of sprouts, if any.

70 Hop (P) **Humulus Lupulus* L. This is a common vine with its long root-stocks under ground and is frequently a source of trouble about old homesteads. The leaves are roundish and 3 to 7 cleft, while the vines are rough with stiff hairs. Persistent grubbing of the roots and cutting of the new shoots will usually clean it out. These vines were originally planted for the production of hops and are often neglected. They are freely attacked by leaf-spot fungi including, *Cylindrosporium Humuli* E & E., *Phyllosticta Humuli* Sacc., *Septoria lupulina* E & K. *and others*, and for several reasons are objectionable when running wild.

71 Hemp (A) **Cannabis sativa* L. This annual grows higher than a man; it has divided leaves with tapering pointed segments. The resemblance to the nettles would usually be noticed; hemp has a very tough, fibrous inner bark and is so distinguished; it is grown in the south. Quite common in waste places, particularly about cities and stock yards and liable to become general. Seeds large, quite irregular as to size, ovoid, about 1-8 inch long, varying from dark to lighter with surface markings. May be looked for as an impurity in seeds from the hemp growing districts. Quite frequent in seed oats.

NETTLE FAMILY, URTICACEÆ.

72 Tall Nettle (P) *Urtica gracilis* Ait. This plant is often found in fence-rows and in moist ground, growing 3 to 6 ft. tall. It is somewhat bristly, and while it has fewer stings than others, it still has stings. The flowers are in clusters and the leaves are ovate (egg-shaped) and coarsely toothed. Nettle is best destroyed by freqnent close cutting or by cultivation. Seeds small, about 1-20 inch long as shown in seed cuts.

73 Stinging Nettle (P) **Uritica dioica* L. This nettle has become introduced at a few places. It is like the other, only very bristly and stinging. It is destroyed by grubbing or cutting.

Seeds with difficulty distinguishable from the preceding.

BUCKWHEAT FAMILY, POLYGONACEÆ

74 Curled Dock, Sour Dock, Yellow Dock (P) **Rumex crispus* L. The curled dock may be recognized by its narrower, curled leaves and other less evident characters. The plant is a bad pest about yards and farm outbuildings. Its large roots make deep cutting necessary; while young, the leaves are used as a pot-herb for "greens." This dock harbors both the melon louse and the corn-root louse. Seeds brown, triangular, 1-12 inch long, two-thirds as wide tapering abruptly to the point, smooth and shining. Very common in clover and alfalfa seed.

All docks require yearly pulling, deep cutting or grubbing, and this must be done before the seeds are formed. They are also destroyed by cultivation.

75 Bitter Dock, Broad Dock (P) **Rumex obtusifolius* L. Broad dock occurs with the last and is very common. It may be distinguished by the broad leaves and more numerous grains on the seed valves.

Seeds like the curled dock, sometimes slightly darker in color and having a more extended beak, tapering more gradually to the tip. Very common in clover seed. It must be remembered in pulling up docks that the large roots contain enough food to ripen the seeds if the grubbing is left till these begin to form.

76 Tall Dock, Peach-leaved Dock (P) *Rumex altissimus* Wood. This dock has a certain resemblance to the others but with distinct botanical characters of leaf and fruit. It prefers moist ground; while a native species it may be found frequently intermingled with the others. Seeds much like the others.

77 Patience Dock (P) **Rumex Patientia* L. A very tall sort of the height of a man, with large leaves and very deep, long root. It is more locally introduced than the others, but must be reckoned with among these pesky weeds. Seeds as in the others, about 1-8 inch long, triangular in form.

78 Sorrel, Horse Sorrel (P) **Rumex Acetosella* L. Sorrel ranks pre-eminently as the worst pest of the order on sandy soils. The illustration (Fig. 16) will show the characters of the plant. The whole has a sour taste. It is perennial and abundantly propagated by its running rootstocks as well as by seed. It is apparently confined to sandy soils; these predominate in the coal measures and subcarboniferous districts, where not covered by the drift. This character of formation underlies that part of the state east of a line from Huron on Lake Erie to Rome on the Ohio River below Portsmouth. Sandy

soils also occur in portions of Lucas, Henry, and Fulton counties, on the old lake beaches south of Lake Erie, and elsewhere in limited areas. The drift clays cover much of the northern portion of the general district before outlined. On suitable lands the sorrel crowds out feeble growths of other crops.

Seeds small, brown, triangular, about 1-20 inch long, almost as broad as long; when thoroughly cleaned, smooth and shining, more commonly invested by a dull brown, adherent covering. Very frequent in clover seeds of all sorts and sometimes in other seeds. Especially difficult to separate from seeds of Alsike clover, samples of which have been received that were found to contain thirteen percent. of sorrel seed.

In dealing with sorrel we cannot hope to eradicate it, at most but to control and subdue it. It is an index of soil character. How far in Ohio it may indicate an acid soil I am unable to state, although the two conditions are associated. In Rhode Island,[1] it has been found that treating the soil with lime largely controls the sorrel.

FIG. 16. Sorrel. The cut shows creeping parts. (*After Vasey.*)

Enough has been done in Ohio, including work on the Station farm in recent years,[2] to justify the conclusion that sorrel is controlled through liming, fertilizing or manuring the land to smother it by the increased growth of other crops, especially clover and grasses. After liming, if the fertility of the soil is sufficiently increased the growth of forage plants will smother the sorrel, and infested tracts or fields can be successfuly dealt with only by improving them. Lime used on such lands in Ohio, corrects any acid condition and may serve further useful purposes. Climate will influence results, the maximum good may be looked for in seasons favorable to a good stand of clover and grasses.

79-80 Knotweed (A) *Polygonum aviculare* L. and *Polygonum erectum* L. These weeds are very abundant in yards and by waysides where the ground has been trodden. The first named species is much smaller, the leaves less than an inch in length, while the second or erect knotweed, grows one to two feet high and has leaves one or two inches or more long. These are attacked by a species of mildew, *Erysiphe communis* (Wallr.), which also attacks certain cultivated plants. *Ustilago utriculosa* (Nees) Tul., a smut, is also reported upon knotweed. Seeds rather small, dull black, 1-8 in. long, triangular, apparently not abundant. The knotweed may be prevented by substituting cement walks and paved ways for trodden paths.

81 Pennsylvania Smartweed (A) *Polygonum Pennsylvanicum* L. This is a much larger growing sort than the preceding ones, being from two to four feet in height and sometimes even higher. The flowers are often bright rose color, with gland-tipped hairs on the stem (peduncle) below the flower cluster. The heads of this smartweed are often affected with a smut *Ustilago utriculosa* (Nees), which converts them into a mass of violet spores, thus destroying the seeds. The leaves are frequently spotted by a leaf spot fungus, *Septoria polygonorum* Desm., and also attacked by a rust, *Puccinia polygoni* Pers.

Seeds rather large, lenticular (lens-shaped), 1-8 in. long by 1-12 in. wide, dark and shining. Frequent in clover seed since this plant ripens its seeds at the time of cutting clover for seed. Destroy the plants before the seeds are formed. The seeds follow closely the opening of the first blossoms, commonly maturing from August to October.

[1]Report Rhode Island Experiment Station, 1895: 193-199; also 1894.
[2]Bulletin Ohio Agricultural Experiment Station, 159; 1905.

82 Lady's-thumb, Smartweed (A) **Polygonum Persicaria* L. The lady's-thumb is smaller than the last, 12 to 18 inches high, with smooth peduncle and leaves often marked with a dark triangular or crescent-shaped spot near the middle. It is attacked by the septoria already mentioned, and also harbors the corn-root aphis, according to Forbes, the louse appearing with the first leaves of the plant.

Seeds much smaller than the last, lens-shaped or triangular. Found in nearly all clover seed, from which the seeds cannot well be separated by screening. It can be destroyed by preventing it from seeding and by sowing only clean seeds. When such plants occur in fields to be cut for clover seed they should first be removed.

83 Smartweed, Water Pepper (A) **Polygonum Hydropiper* L. This is a smooth, erect smartweed, often reddish in color. The leaves are lance-shaped while the stem grows to a height of one to two feet. The spikes are nodding, often uninterrupted. The seeds are dull, not smooth and shining as in the others. The plant is frequently naturalized in moist places and may be accompanied by the mild water pepper, *Polygonum hydropiperoides* Michx.

84 Prince's Feather (A) **Polygonum orientale* L. Also grows as an escape from cultivation. The more pronounced flower-cluster will distinguish it. The seeds are usually dull, almost circular in outline with point at apex, thick lens-shaped, 1-10 inch in diameter.

85 Black Bindweed (A) **Polygonum Convolvulus* L. Black bindweed is a twining or running annual with leaves shaped like buckwheat and with similar seeds. It is very abundant in bottom lands, where, by overflow, it may be distributed widely. Also found in cultivated grounds. It is attacked by two or more species of leaf fungi.

Seeds dull black, triangular, 1-8 in. long, occasionally found in grain. It has been especially complained of in bran from western mills. To be rid of black bindweed it seems necessary to remove fences and borders of brush and to employ the scythe and torch in destroying plants and seeds.

86 Tear-thumb (A) *Polygonum arifolium* L., *Polygonum sagittatum* L. These two species, the first halberd-leaved, the second arrow-leaved, are often found in low grounds, and make themselves especially known by the prickles on the stems and leaf-stalks. The seeds may come in commercial products; (See weed cuts for latter sort). Destroyed by drainage and by the methods recommended for the last.

GOOSEFOOT FAMILY, CHENOPODIACEÆ.

87 Lamb's-quarters, Goosefoot (A) **Chenopodium album* L. Lamb,s-quarters, Fig. 17, is a common annual weed in cultivated lands. It grows from two to six feet in height but more commonly, two to three feet. The whole plant is more or less mealy in appearance. It is sometimes called pigweed, which name more properly belongs to the amaranths. The young and tender plants are used by southwestern Indians as pot-herbs, but with us they are not made use of.

FIG. 17. Lamb's quarters. (*After Millspaugh.*

It is attacked by several species of fungi, including *Cercospora dubia* (Riess.), *Septoria Westendorpii* Wint., and *Peronospora effusa* (Grev.) Rabh.; the latter fungus is destructive to spinach. With smartweed, ragweed and sorrel it harbors the adults of a small striped beetle, *Systena tæniata*, which is destructive to beets and mangel-wurzels. The larvæ of this beetle also work upon the roots of these plants. This and No. 83, also harbor the melon louse, *Aphis gossypii* Glov., according to Pergande.

Seeds lenticular, round, 1-20 inch in diameter, dull black, ripening from August to November. Frequently found in clover and alfalfa seed. To destroy lamb's-quarters it must be prevented from seeding by cultivation and destruction of all plants. This may be taken as a type of a number of weeds which come in potato fields, corn and other crops receiving only early cultivation. The remedy lies in more thorough destruction of them through better and especially, through later cultivation.

88 Wormseed (A) **Chenopodium anthelminticum* L. This is another annual differing slightly from the preceding in the inflorescence and in having a penetrating (to some, offensive) aromatic odor. It is more frequent in the southern part of the state, but has been introduced generally. Seeds very small, of the size of timothy seed, kidney shaped, light brown, small and shining. Not yet occurring very generally in commercial seeds.

89 Mexican Tea (A) **Chenopodium ambrosioides* L. Mexican tea is from tropical America and differs from the preceding but slightly in the wavy margins of the leaves and in minor characters. The seeds are small like those of the next sort.

90 Jerusalem Oak, Feather-geranium (A) **Chenopodium Botrys* L. Jerusalem oak strongly resembles the preceding, but differs from it in being smaller, having leaves deeply lobed and dull seeds; also occurs in waste places.

91 Nettle-leaved Goosefoot (A) **Chenopodium murale* L. This is sufficiently designated by the name and having the lamb's-quarters in hand or mind. It is distributed less widely in Ohio than some others but may become an omnipresent weed of like character with those better known.

92 Oak-leaved Goosefoot **Cheopodium glaucum* L. Naturalized from Europe, is becoming frequent in waste places and especially along railways.

93 Maple-leaved Goosefoot (A) *Chenopodium hybridum* L. This plant has one to four large, pointed lobes to the leaves, which gives the resemblance and name. While a native plant, it may spread as a weed in waste places.

FIG. 18. Atriplex.

94 Orache Atriplex (A) **Atriplex hastata* L. This plant, Fig. 18, allied to to the garden orache, has recently been introduced and now ranks with lamb's-quarters and pigweed in its pestiferous characters. It occurs especially along railway embankments and on vacant lots in cities. It is very spreading in growth, forming a broad mass one to two feet high and several feet in diameter. It is attacked by the mildew, *Peronospora effusa*, which injures spinach and orache.

Seeds resembling those of lamb's-quarters. Fig. 18*a*, nat. size; *b*, x6.

This weed should be uprooted before the seeds begin to form. Mere cutting with the scythe is not sufficient, because the plant stools freely and the stems are too low to be reached in this manner.

95 The lance-leaved, *Atriplex patula* L., with this marked difference from the figure, also occurs as an Ohio weed.

96 Silvery Orache (A) **Atriplex argentea* Nutt. This is a native of the western United States and is reported by Dr. Kellerman as present in this state. The plant is densely silvery-scurfy with foliage otherwise much as the rest of the genus. Less likely than the commoner sorts to be troublesome as a weed.

97 Western Orache (A) **Atriplex truncata* (Torr.) A. Gray. This requires notice here, since the flat triangular fruits, containing small, circular seeds, are often found in alfalfa seed. For these, see seed cuts.

98 Russian Thistle, Russian Tumbleweed (A) **Salsola Tragus* L. This plant, which is properly a tumbleweed, not a thistle, early proved very aggressive in the west. It was introduced into what is now South Dakota in flax seed a little more than twenty-five years ago. Its occurrence in Ohio has thus far been limited to points along trunk railways, and occasional fields where it seems to have been scattered from western stock cars or in seeds. It has been found in ten or more counties, beginning to appear in 1893. The plant varies greatly in appearance and in leaf character at different stages of growth. While the plants are young the leaves are long and slender, two inches or more in length and less than one-eighth inch in width, but when older these slender leaves drop off to give place to triple, half-inch spines on the flowering branches. At this stage the plant often becomes very large and spreading, forming a top about two feet in height and from two to six feet in diameter. The leaves on this plant are never much wider than wooden tooth-picks and form no broad leaf blade. This alone will enable an observer to distinguish it from the common tumbleweed which is so frequently mistaken for it. On the tumbleweed there are flat leaves about two inches long having a broadened blade 1-2 inch or more in width. The Russian thistle has, so far as now known, been exterminated at every point where it has been introduced in Ohio, thanks to the interest taken by the railway officials and others. The attention given the Russian thistle has led to greater care generally in the destruction of weeds along railroad rights-of-way. While a great deal more yet remains to be secured, it seems to me that this weed affords an illustration of what can be done in limiting the spread of a newly introduced weed.

The seeds of the Russian thistle are very characteristic, about the size of clover seed, light yellow, conical, showing coiled embryo, but usually invested by a thin, grayish coating. They are very different from those of tumbleweed which are much smaller, flattened, round, dark and shining; they occur frequently in alfalfa seed from the west. To eradicate the Russian thistle it is only necessary to uproot all plants before August 15th. After that date it is necessary to burn the plants which are green and succulent, with brush or logs. It has proved possible to prevent this weed from gaining wide dissemination in Ohio. Yet this result was reached through persistent care and by reason of the easier handling of the weed.

99 Kochia (A) **Kochia Scoparia* (L.) Roth. This plant is now very commonly cultivated and has freely escaped about Wooster as well as elsewhere in Ohio. Its resemblance to evergreens in form of growth makes it popular as a border plant; the change to reddish color of stems and leaves in autumn is also a noticeable feature. The plant is liable in time to become common as a weed and to have similar characters, as such, to others of the tribe. Seeds less regular than those of lamb's-quarters, 1-20 inch in diameter, dull and dark.

PIGWEED FAMILY, AMARANTHACEÆ.

100 Tumbleweed (A) **Amaranthus graecizans* L. This weed, Fig. 19, is another of the pernicious annuals of which we have by far too many. It commonly grows about a foot in height and one or two feet in diameter, and is likely to be found in waste grounds generally. It is not very frequent in cultivated lands but is often met with along railways. It may be distinguished from the Russian thistle, for which it is often taken, by its having leaves with a definite, flattened blade 1-2 inch or more in width and by the small, round, shining seeds. It is attacked by a white mold, *Cystopus Bliti* (Biv.) Lév., which also attacks the beet.

Seeds, as shown in the illustration, enlarged four times, round, lenticular, 1-32 inch in diameter, dark brown, smooth and very shining. Met with in clover seed. Here, however, less frequent than the seeds of pigweed, *Amaranthus hybridus*, from which they may be distinguished by the more distinct wing-like border. To be destroyed like other similar annuals by preventing the ripening of its seeds, which mature from August to the end of the season.

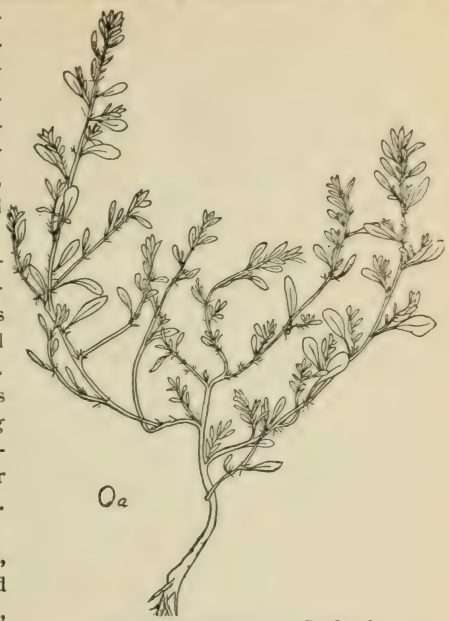

FIG. 19. Tumbleweed. Seed x 4.

101 Low Amaranth (A) **Amaranthus blitoides* (Wats.) The low amaranth is a native of the western states and has become generally introduced in waste places and along railways. It differs from the preceding in its prostrate growth, lying and spreading upon the ground. Seeds readily distinguished from the preceding by their double size and similar winged border. To be dealt with as the last.

102 Pigweed, Redroot, Amaranth, (A)**Amaranthus hybridus* L. Pigweed is very common in cultivated fields, growing two to four feet high. It is abundant in gardens and especially in corn and potato fields after they are laid by. The leaves are broad, with wavy margin and long stalks (petioles). These are frequently attacked by a white mold, *Cystopus Bliti*, that also attacks beets. It may be expected to harbor the beet feeding beetle, *Systena tæniata*, already mentioned.

Seeds like those of tumbleweed, about 1-20 inch in diameter, without any manifest border. This large group of annual weeds, belonging to the buckwheat, goosefoot and pigweed families, all require similar measures for their destruction. The seeds ripen from August to November and in addition, are no doubt abundantly stored in most garden soils. Later cultivation and more thorough removal of the weeds in corn, potatoes and other tilled crops is needed to reduce the number of these weeds.


FIG. 20. Spiny Amaranth. (*After Millspaugh.*)

103 Rough Pigweed (A) **Amaranthus retroflexus* L. Rough pigweed is distinguished from the preceding by its pale green color, roughish stems and spikes of double thickness; the growth is generally stouter but weedy characters the same. Seeds slightly smaller than those of No. 100. Plant naturalized from tropical America.

104 Spiny Amaranth (A) *Amaranthus spinosus* L. Is another of the pigweed tribe. It differs chiefly in the pair of spines in the leaf axils. The leaves, blossoms, etc., Fig. 20, will at once suggest the class to which it belongs. In southeastern Ohio this weed appeared just after the war, having possibly been transported from the south in material sent back from that region. Locally it is called soldier-weed.

The plant is a great pest because of its free growth and of its annoying spines. It is most troublesome along the river counties in the southeast, infesting lawns, fields and roadsides.

Seeds dark, lens shaped, round, very small, 1-40 inch in diameter, smooth and shining. Such a pest as this should not be permitted to invade new districts as it is now doing. Prompt destruction of all plants before seeding, as has been above outlined, will in time free lands from spiny amaranth, while watchfulness about its introduction will be amply repaid.

105 Juba's Bush, Bloodleaf (A) *Iresine paniculata* (L.) Kuntze. Is known to be present in Ohio; its weedy characters are unknown to the writer.

POKEWEED FAMILY, PHYTOLACCACEÆ.

106 Poke, Garget (P) *Phytolacca decandra* L. This is a tall, smooth, plant with thick, red stems, two to six feet high, bearing in the fall an abundance of dark berries in grape-like clusters. It is common in deep soils, forming very thick, deep roots. It seems to be distributed largely by birds that feed upon the berries, possibly by the children who make ink of them. While the young shoots of this plant are frequently used as pot-herbs, the root is violently poisonous. The root furnishes a well known officinal remedy. It is reported that sheep eat the berries and leave the seeds on the high points of their pastures. Pokeberry pies are also a matter of tradition, and while those who eat them may survive, as did my Michigan friend who fed upon the cooked berries of black nightshade, one familiar with the poisonous character of this plant will not be disposed to test such pastry. In fact it would seem safer to omit poke from our dietary.

Grubbing or cultivation is the best means of eradicating this weed. If cut well below the crown the plant does not usually send up further shoots.

INDIAN CHICKWEED FAMILY, AIZOACEÆ.

107 Indian Chickweed, Carpet-weed (A) **Mollugo verticillata* L. This is a low, prostrate annual, frequent in the interstices of brick sidewalks about towns and in cultivated grounds. The leaves are clustered at the joints and broader toward the point. Pods many-seeded. Its carpet-like growth is very characteristic.

Seeds very small, reddish brown, about 1-50 inch long, kidney-shaped, with several longitudinal lines around the back and on the sides. Like purslane the seeds are early matured and prompt destruction of the plants by cultivation is necessary to destroy them.

PURSLANE FAMILY, PORTULACACEÆ.

108 Purslane, Pursley (A) **Portulaca oleracea* L. This prostrate, fleshy-stemmed plant, with fleshy leaves and small yellow flowers (opening only on sunny mornings), quickly succeeded by well filled seed capsules, is preeminently a garden pest. It is also found in cultivated fields generally. In the garden we cannot entirely prevent the appearance of purslane even if well trained for other weed destruction. The plant has some value as a food for pigs, but the cost of gathering it is greater than that of producing better food by field crops. This weed is attacked, especially in wet seasons, by a white mold, *Cystopus portulacæ* (DC.) Lév. It makes small yellow spots in the leaves which soon drop off, thus causing the whole plant to have a sickly appearance. This fungus was an obvious check to the purslane in the season of 1896; the scarcity of purslane during 1897 has been the subject of frequent remark. A leaf miner also works its destruction. Purslane also harbors both the melon plant louse, *Aphis gossypii* Glov., and the corn root louse.

Seeds very small, black, kidney-shaped with a decided snout, marked with fine network. Very careful cultivation is required, in rich land, to keep purslane in subjection.

PINK FAMILY, CARYOPHYLLACEÆ.

109 Cockle, Corn-cockle (A) **Agrostemma Githago* L. The pink flowered cockle is too common in wheat fields. Where very abundant it is very difficult to remove the seeds from those of the grain. The seed capsules are early filled, so that the seed is well matured when the grain is gathered.

Seeds black, angular, kidney-shaped, 1-12 to 1-8 inch across, marked with spiny reticulations arranged in rows around the curved sides of the seeds. Very common in wheat, from which about the best separation is secured by hand sifting, using a screen of eight meshes to the inch. Also found in oats. Poisonous to young fowls. The best method of removing cockle is that of pulling from the seed grain. The weed remains only because of carelessness and the neglect of reasonable precautions to remove it.

110 Night-flowering Catchfly (A) **Silene noctiflora* L. A tall, leafy viscid-hairy (sticky), annual, one to two feet high, with few, creamy-white flowers. Lower leaves broader toward tip (spatulate), upper tapering; pod soon ovoid, having a green network of veins without. Frequent in grasses and clover fields, persisting in lawns.

Seeds very abundant, grayish brown, kidney-shaped, 1-20 inch long, regularly and minutely tuberculate over the surface. Distributed in clover, alfalfa and grass seeds. Destroyed by cutting below crown with hoe or spud, or by uprooting.

111 Conical Catchfly (A) **Silene conica* L. This weed has been introduced in Ohio in crimson clover seed purchased in Delaware. It is a rather small, slightly downy annual with narrow leaves, very minute pink flowers and conical, many-nerved pods.

Seeds very small, brown, columnar-kidneyform, 1-30 inch long and beautifully reticulated with basket-form markings on the seed coat. Apparently not infrequent in crimson clover seed, in which it has evidently been brought from the Mediterranean regions of Europe. Probably not a bad pest, though likely to become omnipresent. The seeds can certainly be separated from those of crimson clover by careful cleaning and screening. The plant ripens seeds as early as May or June. Destroyed as other annuals by preventing the ripening of seeds.

112 Sleepy Catchfly (A) **Silene antirrhina* L. Sleepy catchfly is a slender annual, one to two feet high, with narrow leaves. It may be distinguished by the fact that a portion of each joint of the stem is dark and sticky (glutinous). This weed is very abundant locally and while not of the worst class appears to be persistent, especially upon light, sandy soils.

Seeds very much as in night-flowering catchfly, but smaller and darker, 1-40 inch long, seed coat tuberculate in rows, rather distinct. Close scrutiny of grass and clover seeds and thorough cultivation should be practiced for this weed.

113 Soapwort, Bouncing-bet (P) **Saponaria officinalis* L. Bouncing-bet is an example of the many pernicious weeds thought at one time worthy of cultivation. Once established, plants of this character, with underground stems, are very difficult to eradicate. This grows one to two feet in height and has dense clusters of large, pale rose-colored flowers and smooth, oval, tapering leaves. The soapy effect produced by the mucilaginous juice in water will further serve to identify it. Soapwort has become introduced nearly everywhere and may be seen growing in yards, in pastures, along roadsides and railroads. It is a bad weed deserving attention and should be destroyed. The leaves are attacked by *Macrosporium saponariæ* Pk., which causes many spots upon them

Seeds black, flat, smooth, kidney-shaped with beak, 1-16 inch long, marked with tubercular spots. From the situation in which this occurs, close and frequent cutting with salting would seem a good method of extermination; as with other plants having rootstocks, the cutting will need to be followed for two or more seasons. Where the ground can be plowed, cultivation may succeed but it is more likely to spread than destroy the weed. In a few years it will be too late to destroy this weed in many localities.

114 Deptford Pink (A)* *Dianthns Armeria* L. This is a little pink with narrow, linear, hairy leaves and small, rose-colored, white-dotted petals. It is becoming scattered. Like the other annuals of this family it must be kept out by scrutiny of seeds and by cultivation.

115 Chickweed (A) **Alsine media* L. This winter annual, Fig. 21, is as well known to gardeners as purslane. Its small, smooth leaves and very small flowers, whose white petals are shorter than the green sepals, make it easy of recognition. It appears to root slightly and to spread extensively in moist, enriched ground. It may be found in blossom almost the entire year, and ripens seeds so early that it is difficult to clean out. This plant is likewise a host of the melon louse, *Aphis gossypii* Glover.

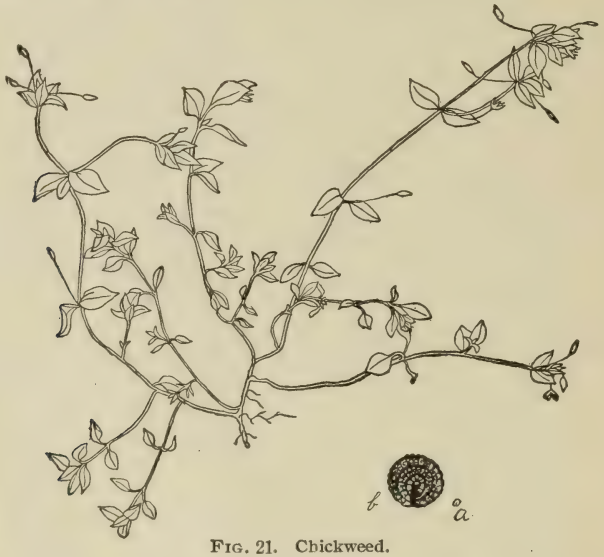

FIG. 21. Chickweed.

Seeds brown, almost or quite circular, flattened, with notch and beak at one side, about 1-32 inch across, tuberculate, much like soapwort, shown in Fig. 21; *a* natural size; *b* x 6. It seems best controlled by some winter crop, such as rye, hairy vetch or crimson clover to crowd it out.

116-117 Mouse-ear Chickweed (P&A) **Cerastium vulgatum* L., and **Cerastium viscosum* L. These two chickweeds, of which the former is the larger and perennial, grow much like the preceding but have hairy leaves. One or the other is often found with it in similar locations. To be dealt with in the same way.

118 Jagged Chickweed (A) **Holosteum umbellatum* L. An additional chickweed with umbelled flowers and notched petals is reported from Cincinnati by W. H. Aiken. It is to be ranked with other annual chickweeds in weedy characters.

119 Spurry (A) **Spergula arvensis* L. This is also called "corn spurry" from its occurrence in English wheat fields. The stem is a foot or more long with narrow leaves clustered at the joints or nodes and small flowers in terminal clusters. The seeds are dull black, circular, lens-shaped, about 1-20 inch across *with distinct margin or border*. With us still local but conspicuous as a winter annual.

120 Knawel (A) **Scleranthus annuus* L. Knawel or German knotgrass is a very low, spreading weed with short awl-shaped leaves. The seed capsules break off and find their way into commercial seeds. Found at Clyde, O., in crimson clover lot but common eastward. See seed cuts. As a weed unobtrusive but persistent in character.

CROWFOOT FAMILY, RANUNCULACEÆ.

121 Black Snakeroot, Bugbane (P) *Cimicifuga racemosa* (L.) Nutt. This, also called rattleroot, is a large ill-smelling weed with tall stems and long spikes of white flowers. It is familiar in fence rows and in new land where it soon yields to close cutting or cultivation.

122 Field Larkspur (A) **Delphinium consolida* L. This field larkspur, with its leaves cut into narrow lobes, at times in company with another species, frequently becomes introduced into grain fields. The long-spurred, various colored flowers along with the leaves will serve to identify it.

Seeds black, of various forms, 1-12 inch across, with roughened-covering over the whole seed. Distributed in grain and other seeds, Being an annual it may be killed out by destroying the plants and seeds.

123 Small-flowered Crowfoot (B) *Ranunculus abortivus* L. Is a biennial weed with smooth, round or kidney-form, lower leaves, divided stem leaves, and very small, yellow petals. The flowers are succeeded by smooth, covered seeds in great abundance. This is a very common weed in low grass lands and in moist, cultivated fields. It is frequently very annoying to the strawberry grower who rates it as a serious pest. It is best overcome by drainage and hoe cutting.

124 Buttercup (A) **Ranunculus acris* L. The acrid field buttercup is rapidly becoming abundant in the pastures of northern Ohio, especially in moist situations. Wherever it is found stock give it a wide space because of its acrid, poisonous juice, which, however, disappears in drying, leaving it harmless in hay. The illustration, Fig. 22, will enable one to recognize it. The showy yellow flowers, having petals shining within, are favorites with children. It commonly grows from two to three feet high.

FIG. 22. Buttercup. (*After Vasey.*)

Seeds small, often invested with covering, apparently introduced in grass seeds. Where but few plants are found they will repay hand digging; where present in large numbers drainage and tilling the soil should remove them.

125 Cursed or Ditch Crowfoot (P) *Ranunculus sceleratus* L. This closely resembles the small-flowered crowfoot from which it is distinguished by its longer, cylindrical heads and thick, hollow stems. The juice like that of the buttercup, is acrid and blistering. Quite frequently found in low pastures and along ditches; so named because of its poisonous character. In most of these places it will repay the labor of removal.

126 Other Buttercups (P) *Ranunculus* spp. Four or five other species, introduced and native, occur in various localities; the native species in damp lowlands, the introduced, in situations where goods with a large amount of packing material are received from Europe. They may be recognized by resemblance to those already given. One of them, the bulbous crowfoot, will be likely to prove troublesome.

127-128 Meadow-rue (P) *Thalictrum polygamum* Muhl. and *Thalictrum purpurascens* L. These tall, handsome plants with their compound leaves and abundant clusters of white flowers are frequently found along brooks and ditches. They may be destroyed by means of hoe or spud.

BARBERRY FAMILY, BERBERIDACEÆ.

129 Barberry (P) **Berberis vulgaris* L. This shrub with its bristly leaves, has been planted for hedges, etc , and has latterly escaped to thickets and copses, notably eastward. This prevalence will increase with us and as the barberry bears the cluster-cup stage (*Aecidium*) of the wheat rust (*Puccinia*) its presence may aggravate rust outbreaks on wheat. Removed by grubbing.

LAUREL FAMILY, LAURACEÆ.

130 Sassafras (P) *Sassafras Sassafras* (L.) Karst. Sassafras is commonly a moderate sized shrub and a great pest in the fence rows of much of the state. With hickories and some others it is abundant, especially in the hilly districts. Although the bark of the root is much prized in making sassafras tea, the shrub is more of a pest than an ornament. The roots persist underground, sending up shoots at frequent intervals. Frequent grubbing is required to destroy them; they, like brush and briers, are commonly monuments of needless fences.

POPPY FAMILY, PAPAVERACEÆ.

131 Field-poppy, Corn-poppy (A) **Papaver dubium* L. The field-poppy, with its lobed leaves, long, bristly stalks, club-shaped, smooth pods and light scarlet, showy flowers has been introduced in crimson clover seed and no doubt otherwise. It produces seeds so abundantly, that care in the destruction of all plants which may be found, is to be strongly urged. Seeds small, brown, introduced as stated above. The plants should be pulled up before the seeds ripen, and the whole burned for efficient destruction.

132 Prickly-poppy, Mexican Poppy (A or B) **Argemone Mexicana* L. This is a rather low plant with bright yellow flowers and large, inflated, spiny pods. It is becoming spread by escapes from gardens and possibly by being sown in seeds. It is a native of Mexico, yet one finds it already on the list of introduced weeds of New South Wales, Australia. The yellow juice and large bladder-like prickly pods, one inch or more long and half as wide, will serve to identify it. It may be killed by digging up the plants before flowering. Seeds globular with straight line of attachment at side, equal to diameter, which is usually about 1-12 inch; surface honey-comb pitted.

MUSTARD FAMILY, CRUCIFERÆ.

This family is one prolific in bad weeds. From the shepherd's-purse, a common winter annual, to the perennial horse-radish it includes a long series of well known pests. Perhaps thirty plants of this family properly rank as weeds, while about twenty-five of them must be admitted to this weed list. The wonderful seed producing power of these plants, and the well known vitality of mustard seeds in the soil, make the mustard tribe one of the most perplexing and difficult to eradicate. With them the cultivator must use all his ingenuity, both in devising methods of seed destruction and in adapting farm practice to these ends. With shepherd's-purse and peppergrass to torment him in clover

fields, horse-radish to kill out of cultivated ground, winter-cress in grass lands, and charlock and black mustard almost universal in his seed oats, even in his bran used for feed, the farmer's mustard problem does not require any exaggeration. Spraying with 2 to 3 percent solution of copper sulfate (8 to 10 lbs. to 50 gallons) or 15 to 20 percent solution of iron sulfate, applied as given under charlock, is an efficient remedy in grain fields.

For those sorts growing and seeding throughout the winter, like shepherd's-purse and penny-cress, some winter green manuring such as rye or crimson clover seems valuable, while for all, the utmost scrutiny of seeds and the greatest care in plant and seed destruction are indispensable. If more objection were needed it is found in the harbors afforded insects, especially plant lice, by many species of the family.

133 Field Peppergrass (A) ******Lepidium campestre* (L.) **R.** Brown. This field pest, Fig. 23, has become introduced into Ohio within the last twenty years. It is now quite general along Lake Erie and locally throughout the whole state. It is especially fitted to take care of itself in permanent grass lands and almost equally difficult to destroy in cultivated grounds. Field peppergrass may be distinguished from all the other similar plants by its downy appearance and clasping leaves and by the spoon-shaped seed pods. The flowers are white and inconspicuous.

FIG. 23. Field Peppergrass. (*After Dewey.*)

Seeds dark brown, rather large, oblong ovoid, tapering at one end, 1-12 inch long, half as wide, rough and dull, shown in Fig. 23 *d*. Becoming frequent in grass and clover seeds and in hay. Like most winter annuals the field peppergrass matures seed early in the season, beginning in May. He who would destroy it must, therefore, soon be about it. Mowing will do little good, so that hand digging or cultivation are the methods available.

134 Roadside Peppergrass (A) ******Lepidium ruderale* L. This is also called narrow-leaved peppergrass and differs from both the others in the divided leaves. It may, in time, become general, though as yet only locally introduced. It is to be dealt with as the others.

135 Peppergrass, Tonguegrass (A) *Lepidium Virginicum* L. This native peppergrass is smooth, with leaves tapering to the base and slightly cut on the border, pods round with notch at the top. Common everywhere in fields and gardens. Peppergrass is attacked by *Cystopus candidus* (P.) Lév. and by *Peronospora parasitica* (P.) Tul., both of which also attack cultivated crucifers. With shepherd's-purse it also harbors the melon louse.

Seeds light brown, flattened, egg-shaped with a very distinct narrow border, 1-16 inch long, half as wide. Very frequent in clover seed and in grass seeds and hay. Chiefly separable from clover seed by the use of proper care in screening. This and the preceding weeds, as well as shepherd's-purse, are peculiarly trying in enriched clover fields. Often the clover seems crowded out or perhaps a lack of stand opens the way for the mustards, since after the hay, these spring up to contaminate the seed crop. With peppergrass and the others we must not only destroy the plants but the reserve store of seeds in the soil. In bad cases of mustards generally there seems no better method of dealing with them than two or more years of successive cultivation in some well tilled, preferably, a hoed crop. In such cases frequent cultivation will induce germination of the seeds in the soil as well as destroy any plants that may begin growth. The measures indicated are drastic but it is well to repeat that half-way measures will not rid lands of mustards.

136 Penny-cress, French Weed (A) **Thlaspi arvense* L. For Ohio, penny-cress is by no means general though promising to become so. It is already common on sandy lands in Lucas and Fulton counties and has also been introduced into Delaware and Hamilton counties. It is a persistent, winter annual, flowering and seeding much of the winter and persisting, by means of its seeds, in the land once occupied. The large, broadened, flat pods, about half an inch in diameter, Fig. 24, *c*, and the other characters given in the illustration, will enable one to identify it. In the valley of the Red River of the North this weed is very abundant and a vile pest. It is there known as French weed.

FIG. 24. Penny-cress.

Seeds dark brown, 1-16 inch long, flat, egg-shaped without border, striate-roughened with curved lines as in the drawing, Fig. 24, *d*. Coming in all seeds and grain from the valley of the Red River of the North, and becoming frequent in hay, grain, clover and grass seeds from northwestern Ohio. Penny-cress can best be subdued by continuous cultivation and by smothering with a winter crop, as rye or crimson clover. In case the first plowing is deferred until late in the season the ground should be covered with straw or other combustible litter and burned over to destroy the seed. This applies as well to any of the other weeds of the mustard family mentioned here.

137 Garlic Mustard (B or P) **Alliaria Alliaria* (L.) Britton. This Jack-by-the-hedge has become started in Ohio. It is a coarse weed with large, rounded, coarsely toothed leaves. Destroyed by hoe cutting.

138 Hedge Mustard (A) **Sisymbrium officinale* (L.)Scop. This is very frequent along roadsides and in waste lands; much less common in cultivated fields than the ones that have been described before. It may be recognized by its spreading, ragged growth, two or three feet high, lobed leaves, small, pale yellow flowers and slender, awl-shapel pods closely pressed to the stem. It may be destroyed by frequent mowing or by cultivation and fertilizing. This weed has another bad quality for the grower of cabbage and turnips; it harbors the club-root fungus, *Plasmodiophora Brassicæ* Wor. These weeds may breed the disease upon land that has never been in cabbage or turnips.

Seeds light to dark brown, 1-16 inch long by one-third as wide, oblong, cylindrical on back, more or less double-wedgeform and grooved on the other side; found in grasses.

139 Tumbling Mustard (A or B) **Sisymbrium altissimum* L. Tumbling mustard has come to us by way of the Canadian northwest where it is a very bad weed, liable to be disseminated in baled hay and timothy seed according to Dewey (Circular No. 7, Division of Botany, U. S. D. A., 1896). It is characterized by the spreading, mature pods produced in great numbers and the free growth to a height of 2 to 4 ft. The leaves are pinnately divided. The plant has been collected in Lake and Preble counties.

Seeds small, slightly elongated, 1-32 to 1-24 inch long, approaching in shape those of spreading mustard but smaller.

140 White Mustard (A or B) **Sinapis alba* L. This is easily confused with the two following species. The beak of the pod is flat and the plant less frequent with us. Seeds light colored, spherical, larger than either of the two following, about 1-12 inch in diameter.

141 Black Mustard(A) **Brassica nigra* (L.) Koch. Black mustard is a tall, prickly plant, growing in waste places and fields. It is often confused with the next, from which it is distinguished chiefly by the pods. The pods of black mustard are four-angled, smooth, oblong, 1-2 inch or more long, contracting suddenly to a slender, conical style 1-8 inch long, while those in charlock are knotted and usually contracted to a stout two-edged beak, commonly containing a single seed in the beak.

Seeds black to dark brown, commonly spherical or ellipsoidal, 1-20 inch long, slightly granular-roughened. Frequent in seeds of clover and grasses, also in forage, but apparently less common than the next; dealt with in the same manner as charlock.

142 Charlock, Wild Mustard(A) **Brassica arvensis* (L.) B. S. P. This is the commonest and worst pest among the Brassicas, occurring in Ohio; it is the plant mostly called wild mustard. It is distinguished from the others by its long knotted pod, with its stout, two-edged beak, Fig. 25. It is among the very worst weeds known to Ohio farmers, especially in the northern half of the state, where oat growing is largely practiced. It comes up and grows with the oats, remaining in them when threshed, or having seeds already ripened when mown for hay. With other Brassicas, charlock harbors the club-root fungus, *Plasmodiophora Brassicæ* Wor.

Fig. 25. Charlock. (*After Vasey.*)

Seeds spherical, 1-16 inch in diameter, larger than those of black mustard. Very common in hay, in seed oats, and in clover seed; retaining their vitality for a long time when buried in the soil. The measures here recommended will apply to black and spreading mustard as well. The oat crop seems to be one particularly favorable to the propagation of these two mustards. Infested land may be rendered comparatively free from them by surface burning and continuous cultivation in hoed crops or by spraying. Where a limited quantity is to be dealt with, hand pulling from the grain, is to be recommended.

Spraying to destroy charlock and other mustards is a recent practice which originated in France and became known in America in 1898. Experiments in the United States and Canada have fully confirmed the European results as to safe destruction of these weeds by the spray,[1-2-3] in crops of cereals. The method is to use a solution of either copper sulfate (blue vitriol) or iron sulfate (copperas) as a spray; of the copper sulfate 2, 2½ or 3 percent solution, (8, 10, or 12 lbs. in 50 gallons), applying 40 to 50 gallons to the acre upon the fields of grain containing mustard plants in dry weather either cloudy or bright and sunny. The most effective results are obtained before the mustard comes into bloom. While the cereals, such as corn, oats and wheat, may show slight apparent injury at the time, the injured plants appear to recover and the mustard is killed or prevented from seeding. Showers soon after spraying may require repetition of spray.

This will kill or injure practically all plants of the mustard family if applied on the foliage. To be especially recommended in wheat and oats on this weed. Of the iron sulfate solution, 15 to 20 percent solution (60 to 80 lbs. in 50 gallons) may be employed as the chemical is cheaper though less active.

[1]Bolley, H. L. Proc. Soc. Prom. Ag. Science, **1899**: 107-109.
[2]Stone, J. L. Bulletin Cornell Experiment Station, **216**: 107-110: **1904**.
[3]Shutt, F. T. Rep. Canada Exp. Farms, **1899**: 194-196.

143 Indian Mustard (A) **Brassica juncea* (L.) Cosson. This is a tall, coarse mustard, of pale color with rather large toothed leaves and long pods. Locally introduced especially along railways. Seeds like th se of 142..

144 Winter-cress (B) **Barbarea Barbarea* (L.) MacM. Winter-cress is a well-known biennial, frequently occurring in meadows. It is illustrated in Fig. 26. The dense clusters of dark green, many lobed leaves are very conspicuous in early spring; these are followed by the upright, branching stems, yellow flowers and the seeds. The leaves alone, taken with the general habit of growth, will enable one to distinguish it from the other mustards. I have frequently observed this weed in meadows the first and second years after seeding. The evidence is conclusive that the seed was introduced in the clover or grass seed sown. Apparently the seeds are frequent in grain, since the fertilizer plots at this Station upon which wheat bran had been used, showed a great deal of winter-cress, while others sown with the same grain and clo er seed, had none. Winter-cress is grown extensively in Europe as a pot-herb and would be useful for this purpose were such a dietary common among our people. Sheep will feed upon it as freely as upon rape or other crucifers. This has suggested its use as a forage plant, in which its weedy habit must be taken into account. It is attacked by a leaf-spot fungus, *Ramularia Barbareæ* Pk.

FIG. 26. Winter-cress. (*After Vasey.*)

Seeds dull grayish brown, oval in outline, 1-20 inch long, somewhat pitted. Distributed in clover and grass seeds. It may be destroyed by uprooting or deep hoe-cutting before the flowers are opened. If cut later than this, burning is needful, since the juices in the plant will mature the seeds.

145 Wild Radish (A or B)**Raphanus Raphanistrum* L. The pods of wild radish are yet more jointed than those of charlock, the leaves are rough, petals yellow, veiny, turning whitish or purplish. It is a vile weed, found in a few counties of the state. It should be destroyed wherever it appears.

146 Marsh-cress(A) *Roripa palustris* (L.) Bess. Marsh-cress has its leaves much parted, small, yellow flowers and small pods, 1-16 of an inch long, tipped with a short style. It is very common in wet places or in shallow water. It is reported as very troublesome in oats in Defiance and Henry counties; perhaps the abundant rain-fall made it prominent during 1896 and 1897. If persistent it should receive the same treatment as charlock and black mustard. Seeds very small, with markings similar to those of false flax.

147 Horse-radish (P) **Roripa Armoracia* (L.) Hitch. Horse-radish requires no description and those who have had any experience in destroying it find it to be a great pest. Any small piece of root may produce a new plant. It is apparently not spread except by gradual extension from small plantings. As with any other weed propagated underground, tracts infested with horse-radish should be separately cultivated. It can be destroyed only by killing every green shoot as it appears above the ground; this may be done by cultivation in a hoed crop or without a crop. It is perhaps easier to kill it out without plowing by a free use of hoe and salt; two or three years will be required for this work.

148 Shepherd's-purse (A) **Bursa Bursa-pastoris* (L.) Britton. This illustration, Fig. 27, will enable one who does not already know this plant to recognize it; the triangular or purse-shaped pods are unlike any other. Shepherd's-purse as a winter annual is a troublesome pest in gardens, orchards and vineyards, and in enriched cultivated lands generally. It is freely attacked by the white mold, *Cystopus candidus* (P) Lév., but nowhere destroyed. It also harbors on its roots the fungus of club-root, *Plasmodiophora Brassicæ* Wor.

Fig. 27. Shepherd's-purse.

Seeds light brown, oblong in outline, 1-20 inch long and half as wide, shown natural size, and x6, *a*, *b*, Fig 27. They may be looked for in hay and seeds. To destroy shepherd's-purse one needs to be diligent. For those situations where it is most annoying some winter growth to crowd it out, together with cultivation, seems the best available method. Both red and crimson clover are worth trying for this purpose where rye can not be used.

149 False Flax (A) **Camelina sativa* (L.) Crantz. False flax is appearing with increasing frequency; the seeds are introduced in clover seed. With recent importations of crimson clover seed from Europe, this seed has also been entered duty free. The plant has narrow, arrow-shaped leaves and a very short, inversely egg-shaped pod.

Seeds brown, 1-10 inch long and about half as wide; pitted-roughened, occurring in clover, alfalfa and flax seeds. Its habits are the same as shepherd's purse and peppergrass. The methods of destroying it are likewise similar.

150-151 Whitlow-grass (A) **Draba verna* L. and *Draba Caroliniana* Walt. These two winter annuals are often found forming dense masses and disfiguring lawns. They require the same treatment as shepherd's-purse.

152 Rock-cress (B) *Arabis lævigata* (Muhl.) Poir. Rock-cress is a smooth, upright plant with partly clasping, narrow leaves. It is often found near the borders of woods and in dry semi-woodlands. It is readily destroyed by cultivation.

153 Spreading Mustard (A) **Erysimum repandum* L. This mustard has small, narrow, toothed leaves and an innocent look until seed ripening approaches, when the seed pods spread out and are jagged and obtrusive. (See Fig. 28) It is a winter annual growing in wheat and likewise as a summer annual in oats; with the latter, the seeds cling in the slit of the grain and at times cause horses to reject the oats; a pestiferous weed identified for the writer by Lyster H. Dewey. First introduced in clover seed at Zanesfield, Logan county and latterly reported abundant in Sandusky county by E. W. Roush of Lindsey, O.

Fig. 28. Spreading Mustard

Seeds oblong, about 1-20 inch long, as shown in seed cut. This weed requires drastic measures where it prevails. In oat fields it is to be destroyed by bluestone spraying like charlock.

154 Hare's-ear Mustard (A) **Conringia orientalis* (L.) Dumort. This is a low plant and has rather large, oval, fleshy leaves which suggest the name. It has been found within the state and may attract local notice. Seeds rather large, elongated, 1-10 inch long and as shown in seed cuts.

155 Alyssum (A) **Alyssum alyssoides* (L.) Gouan. In this we have another low, hairy, European mustard with narrow leaves broadened toward the end, and small pods resembling those of peppergrass. It has been introduced into Ohio in crimson clover seed.

Seeds light brown, lens-shaped, oval, 1-16 inch long, resembling somewhat those of peppergrass, but smaller. It requires the same methods of destruction as the other annual mustards.

CAPER FAMILY, CAPPARIDACEÆ.

156 Polanisia, Clammy-weed (A) **Polanisia graveolens* Raf. Polanisia is a low growing annual with unpleasant smell and sticky-hairy leaves and stem. Most abundant along the gravel-ballasted railways. It may readily be destroyed by hoeing or uprooting.

ORPINE FAMILY, CRASSULACEÆ.

157 Live-for-ever, Garden Orpine (P)**Sedum Telephium* L. This cultivated plant, with its stout stems two feet high and oval, blunt, thick leaves is common in gardens. Escaped to the fields its numerous thick tuber-like rootstocks make it the worst of pests. So tenacious of life is this plant that the stems readily strike root and extreme measures are needed for its destruction. In some cases fields are overrun with live-for-ever. The pest appears to be spread exclusively by the root.

Weeds of this character require the most severe measures for their destruction. The cutting and salting or use of sulfuric acid as mentioned for Canada thistle will destroy them. Recently, Mr. M. E. Merchant of Guilford, New York, has been sending out diseased live-for-ever plants. In them the leaves have dropped off and the thick rootstocks have begun to decay. They are recommended to be planted about in the patches of this weed, thence the disease is said to spread to the healthy plants. The nature of the disease and the success of the method are not sufficiently known to warrant recommendation. This, however, may prove a useful means of destroying live-for-ever, although it failed to yield decisive results with the writer.

158 Love-in-tangle, Mossy Stonecrop (P) **Sedum acre* L. This is a spreading, moss-like plant with bright yellow flowers, common in cultivation. It has escaped in many localities and one case of severe poisoning from eating it is reported. It should be thoroughly destroyed where found.

ROSE FAMILY, ROSACEÆ.

159 Running-brier, Dewberry (P) *Rubus procumbens* Muhl. The dewberry, with its long, trailing stems, is frequent in dry fields, especially to the southward. It ranks with the next and requires the same treatment.

160 Common Brier, Blackberry (P) *Rubus nigrobaccus* Baily. The common bramble needs no description for its identification. It is present everywhere by waysides and in fence rows and appears to be doing its utmost to lead farmers to recognize their own interests in abandoning fences as far as possible. It also infests many fields to their great damage. The thrifty growing blackberries produce an abundance of luscious fruit and where desired for fruit are valuable.

The wild and cultivated blackberries are infested with bramble rust, *Cæoma nitens* (Schw.). This rust destroys cultivated blackberries and raspberries, since the fungus persists in affected stools. The briers also harbor many insects which prey upon the cultivated sorts. Briers may be destroyed by frequent mowing and by cultivation. The cutting seems to be most effective when done late in the summer.

161 Cinquefoil, Fivefinger (P) *Potentilla Canadensis* L. Fivefinger, named in allusion to its five leaves (leaflets), forms by its long runners a thick covering on dry and sterile soils. Its bright yellow blossoms are quite showy. Cinquefoil serves to indicate that the infested lands require enriching and reseeding, possibly liming as well. Shorter rotations with clover and the application of manure or fertilizers will be found useful in those portions of the state where cinquefoil is frequent. Like some other weeds it may be easily smothered out by the growth of forage plants.

162 Tall Fivefinger (B or P) *Potentilla Monspeliensis* L. This weed grows one to two feet high, has a hairy stem and leaflets in threes, not in fives as the name indicates. The flowers are small and inconspicuous, while the growth of the root leaves is very dense.

Seeds light colored, very small, 1-32 of an inch long, nearly circular but with one flattened side. Frequent in timothy seed and seeds of other grasses. The plant is best destroyed by close cutting in spring or early summer or by cultivation. Mowing with the scythe is not sufficient to prevent it from seeding as it sends up shoots anew.

163 Large-flowered Fivefinger (P) **Potentilla sulphurea* Lam. This plant may be recognized from its larger, pale yellow flowers and deeply toothed leaflets, five to seven in number. Seeds small, coming in grass seeds with increasing frequency. Destroyed by cutting with hoe or by cultivation.

164 Agrimony, Stickseed (P) *Agrimonia hirsuta* (Muhl.) Bickn. The characters of smaller stickseed, which grows one to two feet high, may be seen from the illustration, Fig. 29. The leaves are similar to those of the strawberry and rose, with large and small in alternating pairs. The small yellow flowers come in slender clusters at the ends of the branches; they are followed by pear-shaped clusters of prickly-hooked fruits, detrimental to sheep and wool. More frequent in shady places and along ditches. It may be destroyed by careful cutting twice or more times a year.

Fig. 29. Agrimony. (*After Millspaugh.*)

165 Soft Agrimony (P) *Agrimonia mollis* (T. &. G.) Britt., may often be mingled with the preceding.

166 Small-flowered Agrimony, Stickseed (P) *Agrimonia parviflora* Solan. This is a much taller plant, resembling No. 164, but with more crowded leaves and smaller yellow flowers; the seeds or fruits are objectionable like those of the others. A frequent and persistent weed in low meadows and along streams. It requires severer measures than the preceding; more frequent cutting or thorough cultivation as well as draining will usually be needed.

167 Wild Rose (P) *Rosa humilis* Marsh. The wild rose is a common intruder in dry banks and by roadsides. This one grows commonly one to two feet high and has very pale petals. In similar situations the sweetbrier, *Rosa rubiginosa* L., is frequently found. These wild roses are another evidence of too many fence-rows.

The seeds of the common roses are straw color to brown, angular, 1-8 to 3-16 inch long. The seeds of a western species, together with the globular rose-hips containing them, are frequent in western oats. Such impure seeds should be rejected. Wild roses are destroyed by grubbing and cutting after the manner of briers and brush.

APPLE FAMILY, POMACEÆ.

168 Thorn, Haw (P) *Cratægus* spp. Species of wild thorn or haw are often a menace in borders and pastures. These harbor the cluster-cup stages of many rusts, and while ornamental in a way, are objectionable as pasture invaders. Removed by grubbing.

PLUM FAMILY, DRUPACEÆ.

169 Peach (P) **Amygdalus Persica* L. In southeastern Ohio there is no more frequent roadside pest than seedling peach trees that spring from cast-off pits. These become affected with yellows and spread the contagion to orchards. They should be persistently grubbed out.

SENNA FAMILY, CAESALPINACEÆ.

170 Partridge Pea (A) *Cassia Chamæcrista* L. This is a low, spreading plant, about one foot in height with rather large, showy, yellow flowers and leaves closing at the touch, Fig. 30. While pretty to look upon it is capable of becoming a serious pest in dry or sandy soils. It is more common southward than in Ohio, but occurs over the whole state. Being an annual, this plant seeds very freely and should be destroyed by cutting or by cultivation before the seeds mature.

Fig. 30. Partridge Pea.

171 Wild Senna (P) *Cassia Marylandica* L. With its tall stems, three or four feet high, numerous leaflets and abundant, curved pods, two or three inches long, wild senna is a conspicuous weed. Its deep, perennial root makes it a persistent offender in the rich hillside, pasture lands of southeastern Ohio. See Fig. 31.

Seeds hard, gray, elongated, 3-16 inch long and half as wide, with smooth, shining coat, much resembling grains of wheat in size but flattened. The occurrence of this weed in permanent pastures makes it difficult to destroy. Cutting with the scythe before the plants come into blossom, if repeated during the season, ought soon to kill much of it. Where limited in quantity the use of the hoe and salt might be even better, since the salt invites the stock to complete the work of the hoe.

PEA FAMILY, PAPILIONACEÆ.

The pulse or pea family is a most valuable one for the agriculturist. To it belong the peas, beans, lentils and lupines, as well as the many clovers so valuable both for forage and for restoring fertility to the soil. These plants,

through the mutual working of bacteria which induce the formation of the nodules seen upon the roots, are capable of appropriating nitrogen from the atmosphere and storing it up in the plant tissues to be used for food or for restoring fertility. Such of them as possess this valuable power should not be too hastily placed among the weeds. There are a few serious pests, however, in this family.

FIG. 31. Wild Senna.

172 Black Medick, Yellow Trefoil (B) **Medicago lupulina* L. A branch of black medick or yellow trefoil, is illustrated in Fig. 32. This is properly not a weed in any other sense than its frequent occurrence in other seeds. In this it ranks with white clover and is deserving of being known more generally, while scarcely meriting further recommendation. No other single plant has been sent for identification more frequently the past ten years. It is much less valuable for hay than the tall growing clovers, its chief value being for pasture. It may be recognized by the small, dense heads (1-4 to 3-8 inch long) of little, yellow flowers and the clusters of black seed pods which turn backward upon the stem on ripening. Its strong resemblance to the clovers is noted by all observers. The elongated heads are in contrast to the globular heads of the clovers.

FIG. 32. Black Medick.

Seeds commonly yellow like red clover seed, but smaller; frequent as an adulteration of alfalfa seed. (See seed cuts.)

173 Sweet Clover, White Melilot (B) **Melilotus alba* Lam. The white sweet clover is very common and a branch is illustrated in Fig. 33. There is also another,

174 Yellow Sweet Clover (B) **Melilotus officinalis* L., which occurs more sparingly. The white sort is very frequent in clay ground along roadsides. It grows four to six feet in height and appears very rank.

There may properly be serious question about rating these plants among the weeds. The former weed law included them, which appears to be a mistake. Sweet clover seems to prefer hard, trodden ground, and except under cultivation does

not grow to any extent in soils of good tilth. Its appearance may indicate a soil well adapted to other forage plants like alfalfa, Sweet clover is accordingly an indication of a soil condition which it is, at the same time, the very best plant to bring about. Where an abandoned brickyard or old roadway is to be brought into cultivation, sweet clover is recommended for that purpose. It is one of the valuable forage plants in some parts of the south. And while the stock need to learn to eat it, the objections disappear on drying the hay. For this purpose the white one is to be preferred and it should be cut rather early, before the blossoms appear and before the stems have become too woody. It also makes most excellent mulch or material for composting when cut early and may have value as a cover crop.

FIG. 33. Sweet Clover. *After Millspaugh.*)

Seeds like those of red clover but smaller and flatter. Plants may be destroyed by repeated mowing or by cultivation, as well as others of this class.

175 Rabbit-foot, Stone Clover (A) **Trifolium arvense* L. This is a low, branching clover, five to ten inches high, with soft, silky, grayish heads, hence the name. It is becoming introduced into fields and by waysides.

176 Yellow Clover, Hop-clover (A) **Trifolium aureum* Poll. Yellow clover is a somewhat upright clover about one foot high, with spherical, yellow heads, turning brown with age. This and a smaller one, low hop-clover, are occasionally found; mentioned here for purposes of identification.

177 Axseed, Axwort (P) **Coronilla varia* L. Escaped from cultivation in Brown county, at least. Has the characteristic leaves of the family, and dense clusters of white and pink flowers. May be destroyed by frequent hoe cutting.

178 Axseed (P) **Coronilla scorpioides* Koch. Seeds of this are an impurity in alfalfa seed. These seeds are reddish brown, elongated 1-5 to 1-6 inch long, and slender. See seed cuts.

179 Sticktights, Tick-trefoil (P) *Meibomia canescens* (L.) Kuntze This is a branched, hairy plant with egg-shaped, bean-like leaves and terminal, rough pods, narrowed at the joints. These pods are very adhesive and readily break apart, sticking to clothing or to animals as flat, four to five sided sticktights. It is a common weed in rather low grounds.

The seeds rarely separate from the joints; they are lenticular, kidney-form, about 3-16 inch long. Frequent mowing or hoe cutting will kill out these sticktights or they may be destroyed by cultivation.

180 Tick-trefoil (P) *Meibomia Dillenii* (Darl.) Kuntze. This tick-trefoil is a smaller plant than the preceding, frequently found in dry soils. The leaves are smooth and the plant dark green. It is less troublesome than No. 179 and can be controlled in the same manner. Other species of this genus may be troublesome, resembling the one or the other sort named.

181 Bush Clover (P) *Lespedeza violacea* (L.) Pers. It is also frequent in dry, somewhat sterile soil, similar to that producing cinquefoil. It has pea-like violet blossoms, crowded together at the tips of the stems. It is smothered by fertilizing and cultivation. The other species are similar to this one.

182 Common Vetch, Tare (A) **Vicia sativa* L. This weed very strongly resembles the pea, but has narrow, somewhat tapering, blunt pointed leaves and blue flowers. Not frequent as a weed, but occasionally found in grain fields and waste places. If prevented from seeding it may be killed out in time.

183 Hairy Vetch (A) **Vicia hirsuta* (L.) Koch. The hairy vetch is useful as a forage plant, whence it escapes and its spherical, dark seeds are a frequent impurity in oats.

184 Perennial Vetch (P) *Vicia Cracca* L. The perennial vetch is a native of damp thickets. It has extensive rootstocks, rendering it persistent where once established. In one instance known to the writer the seed had become introduced in grass seed, thus infesting a lawn with the weed. In it the vetch proved a serious pest. It has 20 to 24 rather long leaflets and is covered with soft down; the flowers are blue turning to purple.

It can be destroyed only by starving out the rootstocks, through repeated cutting or cultivation. It will require the same persistence in effort as Canada thistle. Care is likewise needed to avoid breaking up the rootstocks and thus scattering the weed thereby.

GERANIUM FAMILY, GERANIACEÆ.

185 Geranium (A) *Geranium* spp. Several specimens of European geraniums have been found at different points in the state, chiefly in lawns. They are less conspicuous than low mallow, but none the less are weeds. Chiefly annual or biennial.

186 Storksbill, Alfilaria (A) **Erodium cicutarium* (L.) L' Her. This is a low, hairy plant, with finely divided leaves and conspicuous storksbill fruits. A common weed in the old world and likely to become general with us; at present occasional throughout the state. Seeds elongated, hairy, with long, spirally twisted beak.

WOOD SORREL FAMILY, OXALIDACEÆ.

187 Yellow Wood-sorrel, Sour-grass (A) *Oxalis stricta* L. Is the common sour-grass of children, which has three inversely heart-shaped leaflets, usually yellowish green in color. The flowers are bright yellow, the seeds are produced in great abundance. It is a common weed along fences, in lawns and in waste places. Seeds brown, flattened, oval in outline, very small, 1-32 inch long, covered with deep, transverse wrinkles; in hay, etc. This plant requires persistent hand digging to eradicate it.

FLAX FAMILY, LINACEÆ.

188 Flax (A) **Linum usitatissimum* L. The cultivated flax, with its bright blue flowers and numerous seeds, sometimes occurs in grain and clover. In these situations it is evidently sown with the other seeds and may be prevented by care in this regard.

AILANTHUS FAMILY, SIMARUBACEÆ.

189 Tree-of-heaven (P) **Ailanthus glandulosus* (Desf.). This tree is much planted in towns. It is a leafy, rank-growing tree whose staminate blossoms have a very offensive odor. The leaves are very long and pinnate, like those of the walnut. It spreads both by seed and from the root. It should not be planted unless the risk of spread has been duly considered. The ailanthus has been introduced from China. The seed containing fruit is winged, thus rendering it easily carried by the wind. Where extermination is desired frequent grubbing is needed.

SPURGE FAMILY, EUPHORBIACEÆ.

190 Croton, Hogwort (A) *Croton capitatus* Michx. This species of Croton native further west and south, was first collected as a waif near Columbus; possibly not general with us. The seeds occur in alfalfa seed and plants thus produced and having mature seeds have been sent for determination. Seeds smooth with suggestive resemblance to those of castor oil plant, brown, semi-globular, about 1-8 inch across. Prevented by avoidance of impure seeds.

191 Three-seeded Mercury, Waxball (A) *Acalypha Virginica* L. Is a leafy plant one to two feet high with long stalked, egg-shaped, bluntly toothed leaves. The seeds are borne in the axils (angles) of the leaves inclosed by fruiting leaves (bracts) with 5 to 9 lobes or points. Very common about buildings and in enriched waste ground, also in clover seed in which its seeds are a frequent impurity.

Seeds straw color to gray, ovoid, 1-16 inch long with wavy lines extending lengthwise, easily crushed between the fingers, hence the name waxball. Very common in clover seed from which they can not well be separated in cleaning. The time to remove such seeds is before the clover is cut. Controlled by destruction of the seeds.

192 Flowering Spurge (P) *Euphorbia corollata* L. Flowering spurge, Fig. 34, is common in dry soils. It grows two or three feet high and exudes a milky, acrid-poisonous juice when the stems are cut or broken. The favorite habitat is in land of low fertility where it is avoided by stock.

FIG. 34. Flowering Spurge. (*After Millspaugh.*)

Seeds ash color, thick, 1-12 inch long slightly uneven. This plant has rootstocks underground and requires repeated cutting for its destruction.

193 Spurge (A) *Euphorbia nutans* Lag. It is an erect, branching herb, with reddish-green stems and small leaves tinged with red on the margins and with a red spot near the base. It has small white or reddish flowers and the abundant milky juice of the preceding; it is common in dry soils along pathways and roadsides. It has been accredited with causing slabbering in cattle. Seeds dark, slightly four angled, transversely grooved, 1-24 inch long. Found in clover seeds and in seeds of grasses; also in hay. Destroyed by early pulling or hoe cutting and by cultivation.

194 Spotted Spurge (A) *Euphorbia maculata* L. Spotted spurge is a prostrate, spreading, commonly hairy, small plant with browish-red spots on the leaves.

This one grows frequently in the interstices of unused walks and by roadsides. It has the milky juice of the family and the same objections hold against it as against the others. Seeds ash-gray, 1-30 inch long, ovate in outline, sharply four-angled with four shallow grooves across each side. Frequent in seeds of grasses and clover. Destroyed like the preceding.

195 Cypress Spurge (P) **Euphorbia Cyparissias* L. Cypress spurge is another of the same tribe, once thought by some to be worthy of cultivation. It is capable of proving equally as bad as toad-flax, live-forever, and other "flower-weeds." It is shown in Fig. 35, that it may be recognized. The stems are in dense clusters, six to ten inches high with numerous narrow leaves, giving the plant a graceful appearance. It has been so much planted in country cemeteries that it might with propriety be called "graveyard weed." The rootstocks propagate the plant in a widening circle each year, so that no other flowers are able to resist its encroachments. Cemetery trustees should prohibit its planting in these places and require its destruction where it is grown in them. It apparently spreads by the root.

The seeds are as shown in Fig. 35, *a b c*; these figures are copied from Nobbe.

Repeated cutting and salting is perhaps the best method to destroy cypress-spurge in small patches. This will need to be continued until the underground stems have been starved out as with the other plants that have been mentioned.

FIG. 35. Cypress Spurge.

SUMAC FAMILY,

ANACARDIACEÆ.

196 Sumac (P) *Rhus glabra* L. Smooth sumac is a low shrub with pithy stems and pinnate leaves, frequently troublesome in sandy lands and in fence-rows. The taller stag-horn sumac, *Rhus typhina* L., similarly occurs in waste places. Both may be recognized by their dense clusters of bright red, acid berries. The leaves of the European sumac, *Rhus coriaria*, are used in tanning. The American species have not been utilized for this purpose and are probably valueless. Neither of these species is poisonous to the ordinary person. Destroyed by grubbing or by repeated cutting.

197 Poison Ivy, Poison Oak (P) *Rhus radicans* L. The poison ivy is a woody vine, climbing over trees and fences by means of its numerous air-roots. It is very frequent on Ohio fences. By reason of some poisonous property, or perhaps, some poisonous exudation, many persons touching it or coming near it suffer from the painful skin eruption known as ivy poisoning. The swamp sumac, *Rhus vernix* L., also produces similar but more violent poisoning. One can avoid the swamp sumac, but the poison ivy is too common to be escaped altogether. It has *three leaflets* on each leaf stalk. These are commonly broader toward the base. It is often confused with the Virginia creeper, a harmless and beautiful vine, which has *five* or *more leaflets*, broader toward the point. Poison ivy should be killed out by grubbing and fire. Occasional persons can handle it with impunity; they are available in its destruction. Neglect is the only sufficient reason for permitting poison ivy to remain.

MALLOW FAMILY, MALVACEÆ.

198 Low Mallow, Cheeses (b) **Malva rotundifolia* L. This mallow is a common garden and roadside weed; it has much scalloped leaves and small white or rose-colored flowers, succeeded by flat, cheese-like masses of seeds, similar to those of the hollyhock. Children sometimes gather and eat these masses, calling them "cheeses." It has a long tapering root, which fits it to grow in trodden earth.

Seeds very numerous, brown, kidney-shaped, 1-16 inch across, thicker on the curved side with notch and beak at the other; apparently mallow seeds retain their vitality for a long time when buried in the soil. It requires pulling or grubbing to destroy the weed in ground that cannot be cultivated.

199 High Mallow (B) **Malva sylvestris* L. It is a tall plant, two or three feet high, resembling the hollyhock. The leaves are sharply five to seven lobed and the petals large, purple or rose color. Occasionally found by roadsides. Destroy by digging or cutting.

200 Sida (A) **Sida spinosa* L. The spiny sida, which is becoming very frequent in the southern half of the state, especially on dry land, is a native of India. It is soft-downy, 10 to 20 inches high and much branched. The leaves are long, egg-shaped, tapering and sharply saw-toothed. The flowers are small, greenish yellow, shaped like those of the hollyhock. There is a little tubercle at the base of the leaf on some of the plants, which gives it its name. For the soils indicated the sida is very frequent about gardens and potato fields.

Seeds dark brown, the shape of a quarter sphere, 1-12 inch long, smooth and dull. Like other annuals, this weed must be prevented from seeding in order to destroy it.

201 Glade Mallow (P) **Napæa dioica* L. This is a tall, roughish, perennial weed with very large, 9 to 11 parted lower leaves and small white flowers. It is becoming introduced especially about cities. To be destroyed like low mallow.

202 Velvet-leaf, Indian Mallow (A) **Abutilon Abutilon* (L.) Rusby. Velvet-leaf is a tall annual, 4 to 5 feet high, with large, velvety, heart-shaped, pointed leaves; conspicuous in corn and potato fields, and especially in bottom lands. The flowers are yellow, the seed capsules are urn-shaped and many pointed or beaked.

Seeds very numerous, dark gray, kidney-shaped or pipe-shaped, by reason of the long nose, 1-8 inch across, slightly roughened. Found in hay, etc. This weed is easily exterminated by pulling or cutting before the blossoms open. Its presence does not indicate care.

203 Bladder-ketmia, Flower-of-an-hour (A) **Hibiscus Trionum* L. It is a rather low, hairy annual, having three parted leaves with tapering divisions. It has a sulfur-yellow, showy corolla with dark center (eye), soon closing, hence the name, flower-of-an-hour. Frequent in gardens and along roadsides. Capable of becoming a conspicuous and obnoxious pest.

Seeds dark gray, angular, kidney-form to obscurely pipe-shaped, 1-12 inch long, with slight roughening and commonly two rounded depressions in opposite sides of the seed. Deserving of complete destruction before flowering.

FIG. 36. St. John's-wort. (*After Vasey.*)

ST. JOHN'S-WORT FAMILY, HYPERICACEÆ.

204 St. John's-wort (P) **Hypericum perforatum* L. This herb is an upright, woody-stemmed plant, 1 to 2 feet high. It has opposite leaves, dotted with small black spots, and bright yellow flowers with numerous stamens; see Fig. 36. It is a troublesome weed in pastures and meadows. Seeds oblong or slightly curved, 1-20 inch long, surface pitted in rows, apparently often distributed in grass seeds. It is best destroyed by digging it up.

205 Dwarf St. John's-wort (A) *Hypericum mutilum* L. Dwarf St. John's-wort is tufted in growth, usually less than a foot high, often with a height of but six inches or less. Like the others, the flowers are yellow, in close clusters, followed by many pointed capsules. The leaves of this plant turn reddish toward fall and mark certain soil characters at Strongsville Test Farm, indicating lack of lime. Should be eliminated by improved soil conditions, (notably by liming) and by cultivation. Seeds cylindrical, smooth, about 1-48 inch long.

206 Shrubby St. John's-wort (P) *Hypericum prolificum* L. It grows in dense clusters of upright, shrubby stems, 2 to 4 feet high, in exhausted and sterile, dry fields. The flowers are much like the preceding, and the small woody branches are two edged. Should be grubbed out and the land reclaimed by manuring and cultivation.

LOOSESTRIFE FAMILY, LYTHRACEÆ.

207 Clammy Loosestrife (A) *Parsonsia petiolata* (L.) Rusby. Is a very sticky, red stemmed annual, found throughout southern Ohio. The plant grows about a foot high, has egg-shaped, tapering leaves and small purple flowers. It is most frequent in dry fields and roadsides, occupying similar places to those infested by sida, especially pastures. The conspicuous feature of the weed is its very sticky (viscid) character of leaves and stems. Destroyed by uprooting before the seeds are formed.

EVENING PRIMROSE FAMILY, ONAGRACEÆ.

208 Water-purslane (P) *Isnardia palustris* L. This is a prostrate, smooth weed, with small, egg-shaped, reddish leaves. It is very common in ditches and one of the serious pests of muck farms. Where too obnoxious it should be pulled up.

209 Seed-box (P) *Ludwigia alternifolia* L. This is a smooth, branched plant, about three feet high, with narrow leaves pointed at both ends, and cubical pods with wings at the angles. It is frequent in swampy lands and sometimes occurs with spiny sida. Seeds very small, brown, 1-50 inch long and one-third as wide. Destroyed by frequent cutting.

210 Willow-herb (P) *Epilobium* spp. The willow-herbs are somewhat downy plants of wet places, one to three feet high, with tapering, sharp-toothed leaves, resembling those of willows. The seeds have a woolly attachment of the seed coat which renders them buoyant. Usually disposed of through drainage and cultivation, by which the land is tamed.

211 Fireweed, Great Willow-herb (P) *Chamænerion angustifolium* (L.) Scop. Has a very tall, unbranched stem 4 to 7 feet high, and scattered, tapering leaves. The flowers are showy, bright rose color to purple. It is sometimes very abundant in newly cleared lands. Fire seems to induce germination of the seeds protected by a layer of soil; hence the name. The seeds are very small, similar to those of the preceding; they are buoyant and can be transported by the wind. Destroyed by very early cutting or cultivation.

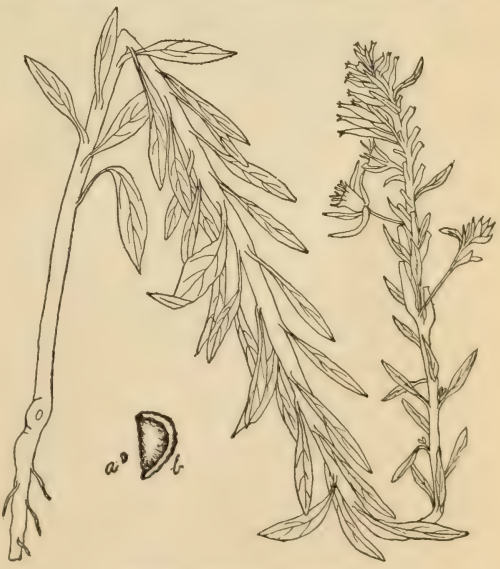

FIG. 37. Evening Primrose.

212 Evening Primrose (B) *Onagra biennis* (L.) Scop. This is a tall, stout, very leafy, somewhat downy or hairy weed usually unbranched, from 2 to 5 feet high, see Fig. 37. The stems are often decidedly reddish; this character is lost when shaded. The leaves are two to six inches long. It has bright yellow, stalked flowers which open in the evening. This primrose is a frequent pest in fields, and by streams and roadsides, where it is generally neglected.

Seeds brown, rather small, 1-32 inch long, angular, shown x6, Fig. 37*b*. Distributed in grass seeds. The evening primrose is often a very troublesome pest. It is killed by early pulling, low cutting or by cultivation, but will stool if mown. It should not be permitted to occupy fields, from all of which it can be obliterated by reasonable care. Any biennial with this character of seed can be subdued.

213 Gaura (B) *Gaura biennis* L. This plant has pointed, willow-like leaves, and whitish flowers, turning to pink or red. The root is deep, like that of evening primrose, which the plant resembles in its weedy characters. The seed or fruit is 1-2 inch long and 4 ribbed.

PARSLEY FAMILY, UMBELLIFERÆ.

214 Wild Carrot (B) **Daucus Carota* L. Wild carrot, Fig. 38, sometimes called bird's nest, is a vile pest. It grows from 2 to 4 feet high and has a bristly stem and much divided leaves, like the cultivated parsley. The flowers are in broad, showy umbels, which turn inward from the outside, forming a neat bird-nest cavity. A bad weed of the field and roadside. Wild carrot is infested by the leaf-spot fungus, *Cercospora apii*, which also attacks celery.

FIG. 38. Wild Carrot. (*After Vasey.*)

Seeds brown, 1-8 inch long, oval in outline, with many white prickles in lines along the seed, shown in Fig. 38, 3. Often distributed in clover seeds and among grasses. Wild carrot is one of the vile weeds whose destruction should be required. The plants should be cut with the hoe or spud before blossoming or pulled up following rains; if mown, they stool again and produce seed later. When a clover field is discovered to be infested with wild carrot it is better to plow again and cultivate in corn than to permit the weed to gain a foot-hold upon the farm. So conspicuous a weed can readily be rooted out.

215 Angelica (P) *Angelica atropurpurea* L. Angelica is a tall, stout plant with thick, purple stems and spherical flower-clusters (umbels) 3 to 4 inches in diameter, at least so in fruit. Leaves much divided into leaflets one to one and one-half inches broad. Common in river bottoms. This may be killed out by grubbing the deep root.

216 Cow-parsnip (P) *Heracleum lanatum* Michx. Cow-parsnip is frequent in low borders, meadows and pastures. It is distinguished by its very large toothed leaflets, downy beneath, and the inflated petioles, as well as by the deep, thick root. Not intrusive but persistent when established. May be removed by grubbing.

217 Wild Parsnip (P) **Pastinaca sativa* L. Wild parsnip is a familar weed too often neglected. It has commonly a thick, grooved stem, rather long leaflets, a wide spreading umbel of yellow flowers and a deep root like the cultivated parsnip. The root is poisonous even after cooking. Persons who have eaten it were seriously attacked. Wild parsnip harbors the fungus, *Cercospora apii*, which so seriously injures celery. The weed is found more frequently in moist ground but flourishes nearly everywhere.

Seed whitish, thin, 1-4 inch long, 3-16 wide; carried to some extent by the wind. The parsnip, like the carrot, may be killed out through deep cutting before the plants bloom. This may be done either in late fall or early spring. About celery gardens the presence of the fungous parasite on wild parsnip and wild carrot should lead to their complete destruction.

218 Meadow-parsnip (P) *Thaspium* spp. The meadow parsnips are similar in appearance to wild parsnip though much smaller and with stems much less or not at all grooved. They sometimes infest fence-rows and cultivated ground along ditches. Destroyed by frequent cutting with hoe and by cultivation.

219 Caraway (B) **Carum Carui* L. It resembles wild carrot yet may be distinguished from it by the difference in the flower clusters; those of caraway not forming the peculiar bird's nest of wild carrot. The roots are thick and fleshy. This plant has escaped about Vermillion, Erie county, where it is proving as troublesome as wild carrot. It is also reported from several other places. It should be treated with the same vigor as that accorded to wild carrot.

220 Poison-hemlock (B) **Conium maculatum* L. Poison-hemlock is a large, much branced, European weed, growing in waste places. It has spotted stems, large, compound leaves and white flowers. This is a dangerously poisonous plant named after the Hemlock by which, as Dr. Gray observes, "criminals and philosophers were put to death at Athens." It should be eradicated by digging it out each spring.

221 Water-hemlock, Spotted Cowbane, Beaver-poison (P) **Cicuta maculata* L. This is a stout weed, 2 to 6 feet high, having its stems streaked with purple and compound leaves with leaflets, 1 to 5 inches long, as shown in the illustration, Fig. 39. It commonly grows in marshy places and, as its name indicates, is a very poisonous plant which should be removed from all farm lands. The danger in cases of this sort is too imminent to permit of neglect.

FIG. 39. Water-hemlock. (*After Vasey.*)

DOGWOOD FAMILY, CORNACEÆ.

222 Panicled Cornel (P) *Cornus candidissima* Marsh. This is a small dogwood, a shrub 4 to 8 feet high, with many smooth gray branches, characteristic, egg-shaped, pointed leaves, whitish beneath and white berries. It often infests low, somewhat marshy land, where it is killed out by draining and cultivating.

HEATH FAMILY, ERICACEÆ.

223 Laurel, Sheepkill (P) *Kalmia latifolia* L. Laurel or calico-bush is a tall shrub, growing on sandy points or hillsides in eastern and southeastern Ohio. It has rather broad, bright green leaves, remaining on the bushes over winter. The flowers are in large, showy clusters, rose colored to white with dark spots. This is found only in the uncleared land but its leaves are very poisonous to sheep that may eat of it freely in winter or early spring. It should be grubbed out upon every farm. It will pay to grub it out of the woodlots and save the many sheep that are likely to be lost.

PRIMROSE FAMILY, PRIMULACEÆ.

224 Moneywort (P) **Lysimachia Nummularia* L. Moneywort is another of the pretty flowers that are only pretty to look upon. It has smooth, creeping stems with small, roundish, yellowish-green leaves and showy, bright yellow flowers. It is often found in lawns and by roadsides, forming dense patches and crowding out everything else. Once started it can scarcely be controlled without cultivating the infested lands for some time. It should never be planted on account of its aggressive habits and is unfit to remain in public cemeteries, where it is often found. Besides thorough cultivation, the use of hoe and salt will be found efficient to destroy it.

225 Scarlet Pimpernel (A) **Anagallis arvensis* L. Scarlet pimpernel is a low, spreading plant, with 4-sided stems and small, oval, opposite leaves about 1-2 inch in length. The flowers are scarlet to white, commonly with dark center, upon conspicuous stalks, opening only in bright weather. Abundant in waste places and ranking with the chickweeds in character. Seeds numerous, brown, irregularly triangular, about 1-24 inch long.

EBONY FAMILY, EBENACEÆ.

226 Persimmon (P) *Diospyros Virginiana* L. The persimmon occurs throughout southern Ohio and, often like sassafras and hickory, proves a serious pest. It can be removed, however, by grubbing in the manner recommended for the other shrubs just named.

GENTIAN FAMILY, GENTIANACEÆ.

227 Sabbatia (B) *Sabbatia angularis* (L.) Pursh. Is a handsome plant, 1 to 2 feet high, with 4-sided and wing-angled stem, much branched toward the top. The leaves are egg-shaped, and somewhat heart-shaped at the clasping base. The flowers are showy and rose colored. This is very frequent in dry grass lands throughout the coal measure region. It is not especially troublesome and can be cleaned out by cutting.

DOGBANE FAMILY, APOCYNACEÆ.

228 Periwinkle (P) **Vinca minor* L. The common periwinkle, incorrectly called myrtle, is frequently planted for ornament. It has long, trailing stems, green leaves persisting throughout the winter, and pretty, bluish-purple blossoms. It also has extensive underground stems by means of which it invades surrrounding areas. While very pretty to bank about dense evergreens, it should never be planted intentionally and should be treated to liberal doses of hoe and salt until exterminated. The old proverb applies in the planting of such weeds.

229 Spreading Dogbane (P) *Apocynum androsæmifolium* L. The spreading dogbane is a low plant, usually about a foot high, with milky, poisonous juice. The stem has many diverging branches, the leaves are egg-shaped with a foot-stalk (petiole), the flowers numerous, 1-3 of an inch across, rose colored and handsome. The leafstalks and larger, pretty flowers distinguish it from the next. This weed has long, running rootstocks like the common milkweed; these render it difficult to eradicate. It infests dry thickets and borders. I have met it most frequently as a field weed in the vineyards of northern Ohio.

Seeds brown, slender, about 3-16 inch long, with a dense tuft of silky hairs at the tip for carrying by the wind. These seeds are contained in slender, smooth, tapering pods about four inches long by 3-16 inch in diameter. Can be destroyed only by continuous clean cultivation or by repeated hoe cutting. As in other examples of rootstocks, these must be starved out.

230 Indian Hemp, Dogbane (P) *Apocynum cannabinum* L. Is the more poisonous and troublesome of the two, and is spoken of through the state as the small-leaved milkweed; the leaves are oval or tapering, two inches or less in length. It has, like the other, milky juice, but grows taller and more erect, 3 to 5 feet high, with small yellowish-green flowers in broad clusters at the tips of the stems and branches. The pods are tapering as in the other but longer, 5 to 6 inches. The leaves are almost without stalks. Indian hemp has yet more numerous rootstocks, and growing as it does, in rather damp bottoms, it is difficult to destroy. The plant has been suggested for fiber production, but for this purpose is thought to be inferior to swamp milkweed. (See Fig. 40.)

Seeds brown, slender, about 3-16 of an inch long, tapering to both ends, with abundant tufts of silky hairs. Eradicated only by persistent cutting and salting or by continued cultivation.

MILKWEED FAMILY, ASCLEPIADACEÆ.

231 Butterfly-weed, Pleurisy-root (P) *Asclepias tuberosa* L. Butterfly-weed occurs only in dry ground, growing 1 to 2 feet high. It has rough, hairy stems with very numerous, rather narrow leaves and dense umbels of bright orange flowers. It occurs most frequently by roadsides and in waste places in the southeastern and northwestern portions of the state. The juice is not milky, the pods are grayish, turning backward. The root is rather deep; it is an officinal remedy.

Seeds flat, broadly winged, with abudant silky hairs. While a handsome plant, worthy of cultivation, it is, nevertheless, out of place in fields and cultivated lands. Removed by grubbing or repeated cutting.

FIG. 40 Indian Hemp. (*After Dewey.*)

232 Swamp Milkweed (P) *Asclepias incarnata* L. As its name indicates, this has milky juice and is found in swampy places. Stems very leafy, 2 to 3 feet high, leaves long, distinctly veined, pointed, the flowers are purple, pods rather slender and smooth. The fiber of swamp milkweed is quite good but not likely to supplant that of flax, hemp, etc.

Seeds brown, flat, 5-16 of an inch long, broadly winged and with attached silky hairs. After draining, this plant still requires repeated grubbing or cultivation.

233 Milkweed, Silkweed, Wild Cotton (P) *Asclepias Syriaca* L. This is the common milkweed of roadsides and permanent pastures; in the latter it is a most serious pest. The stem is softly-downy, tall and stout, 3 to 4 feet high, with oval leaves, pale underneath, 4 to 8 inches long. The flowers are in dense umbels, dull purple, followed by thick warty pods. Fig. 41 shows the plant characters in part. The whole plant has an abundance of milky juice which exudes upon the slightest wound. The long hairs of the seed are abundant and applied to a variety of uses. Instead of a deep tap-root this milkweed has rootstocks by which it extends and spreads underground. For permanent pastures it is one of our bad weeds.

FIG. 41. Milkweed. (*After Vasey.*)

Seeds brown, flat, 1-4 inch long, slightly winged, with an abundance of silky hairs. By reason of its rootstocks it requires continued efforts for its destruction. Repeated cutting with hoe or scythe or continuous cultivation will in time destroy it. For the pasture lands it may be cut two or three times annually with the scythe. Once cutting will not subdue it.

234 Climbing Milkweed (P) *Gonolobus lævis* Michx. Is a climbing, long-stemmed plant with opposite, heart-shaped, pointed leaves and pods and seeds as in the other milkweeds. The flowers are very small and inconspicuous, while the leaves are 3 to 5 inches wide. It is a very troublesome and unsightly weed along fence-rows near the Ohio river, from Brown county westward. Seeds much as in the common milkweed. Climbing milkweed offers good reason for cleaning out fences, after which it will yet require continued cutting and salting or cultivation.

MORNING-GLORY FAMILY, CONVOLVULACEÆ.

235 Man-of-the-Earth, Wild Potato-vine (P) *Ipomœa pandurata* (L.) Meyer. As an example of food storage in large, thick roots this man-of-the-earth, Fig. 42, can scarcely be surpassed. The leaves are long pointed and sometimes fiddle-shaped, the flowers larger than those of the morning-glory, with purple eye (center) and roots very large. Halsted has found some single roots weighing 35 pounds. These are of various forms, often club-shaped, thick and fleshy, two or more feet long, spreading chiefly underground. An enduring pest in sandy or rocky soils, where deep in the earth or in the cavities among the rocks it survives many years. The leaves are attacked by a white mold, *Cystopus Ipomœæ-panduranæ* (S.), which infests others of this group, including the sweet potato.

FIG. 42. Man-of-the-Earth. (*After Millspaugh.*)

Mere occasional cutting will not destroy it and digging out the root is too expensive, even where possible, which it is not, among rocks. The best available method for starving out these large roots is repeated treatment with hoe and salt or with sulfuric acid; salt is generally more convenient and safer.

236 Field Morning-glory (A) **Ipomœa hederacea* Jacq. This morning-glory is found in fields generally. It resembles the cultivated sorts which also grow in fields but often has halberd-shaped leaves. It is attacked by the fungus above named.

Seeds dark, angular, resembling those of cultivated varieties. Destroyed by pulling before seeding.

237 Field Bindweed (P) **Convolvulus arvensis* L. The field bindweed, or small flowered morning-glory, is a somewhat recently imported pest of the most serious sort. The character of the weed may be seen from the illustration, Fig. 43. The leaves and the small flowers, 1 inch or less in diameter at the top, are certain characters of recognition. It grows with stems several feet in length, twining about themselves or about any other plants, which

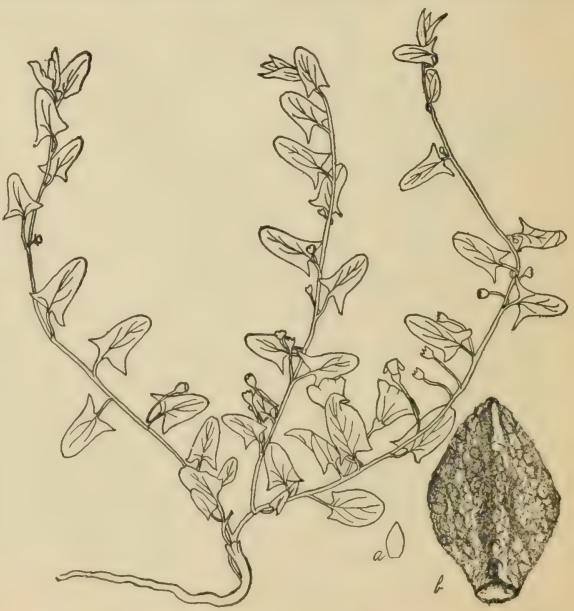

FIG. 43. Field Bindweed.

may happen to be near. Underground it has extensive stems, any piece of which may start a new plant, and by this means it spreads year by year or is scattered by cultivating through the infested patches. Introduced from Europe and frequent along railroads, it is also found in gardens and fields where it is difficult to limit its spread.

Seeds dark, somewhat angular, 1-12 of an inch long. See drawing, after Nobbe, x6, Fig. 43*b*. The eradication of the field bindweed is a very difficult task, yet as with Canada thistle, nothing short of eradication, when found in small areas, will serve the purposes of the land owner. A friend who had his garden infested tried digging it up and then smothering with straw, but without success. A liberal use of hoe and salt would seem the best means of destroying it. True, other vegetation will chiefly be destroyed but this may be endured for a time if the bindweed is also exterminated. The work should begin on the outer fringes of the patches and let nothing escape there. The infected spots should not be cultivated with the surrounding land because of dragging the roots on the plow and tools. Alfalfa seeding and cutting may prove successful, as noted in next.

238 Bindweed, Hedge Bindweed, Morning-glory (P) *Convolvulus sepium* (L.) Willd. The bindweed or bracted-bindweed is a native pest, almost equalling the preceding, but with perhaps, more limit by nature as to soil. It has long, twining stems, and triangular, halberd-shaped, or arrow-shaped pointed leaves with large white or rose colored, funnel-form blossoms, see Fig. 44. In addition to these it has very numerous, creeping, underground stems which possess all the persistent characters of those of the preceding. This weed is more common in bottom lands where, in corn, it is erroneously called peavine; it is also found in moist fields generally.

FIG. 44 Bindweed. (*After Vasey.*)

Seeds dark, somewhat angular-kidney-form, 1-8 inch across. The bracted bindweed is permitted to remain in some bottom lands cultivated continuously in corn. Certainly the continuous cultivation is a favorable opportunity to kill it out if followed by the free use of the hoe in summer and fall. So long as the weed is permitted by late growth thus to recover from the annual shock, it will continue to flourish. Reports of those who have seeded such infested land to alfalfa, show that the repeated cutting of the alfalfa will soon destroy the bindweed, so that it does not reappear on replowing.

DODDER FAMILY, CUSCUTACEÆ.

239 Flax Dodder (A) **Cuscuta Epilinum* Weihe. The dodders are weed parasites growing from seed sown with the infested crop, or permitted to drop upon the ground the previous season. They grow for a time without attaching themselves to other plants and unless a host is found within reach, they die when the stored food of the seed is exhausted, since they form no leaves. Living, slender, leafless, straw-colored stems twine about the host plant, sending sucking organs into it and robbing it. They bear dense clusters of small, whitish flowers, followed by numerous spherical pods full of seeds. The flax dodder attacks the flax in this manner, the seeds being sown with the flax seed and ripening with it.

Seeds brown, small, somewhat the shape of a quarter of an apple. 1-32 of an inch long. Frequent in flax seed. A case of serious damage occurred near Wooster in 1896. It is evident that the only way to prevent flax dodder is to sow no dodder seeds with the flax. The seeds are smaller and may be separated, but it is yet necessary to reject the seed from fields in which the dodder occurs, if one wishes to be wholly safe.

240 Clover Dodder (A) **Cuscuta Epithymum* Murr. Clover dodder is occurring with greatly increasing frequency in Ohio clover and alfalfa fields. It has the same tawny stems, twining about the clover and uniting the stalks above, but robbing and destroying the clover wherever the dodder grows upon it. One correspondent described these spots as resembling the work of fire in clover. It has been sent to this office from many scattered localities, thus indicating the need of very much closer scrutiny of the clover seed sown. The samples of clover and alfalfa seeds examined show a marked percentage of dodder seeds therein. The small cut, Fig. 45, will give some idea of the appearance of a clover stalk with the dodder upon it. Dodder in clover means that the dodder seed has been sown with the clover seed, and further, that no clover seed should be saved from a dodder infested field.

FIG. 45. Clover Dodder. (*After Millspaugh.*)

Seeds small, rusty to brown, 1-32 of an inch long, rounded on back and with roughened surface, occurring in clover and alfalfa seeds. Clover dodder, like flax dodder, can be prevented only by sowing clean seed. When it is found that the clover is attacked by the dodder the field may be plowed at once and cultivated to make sure of controlling the pest; in case the field is left, no seed should be saved from the infested field. In practice, the dodders on clover are a less serious problem than on alfalfa, since the life of the seeding is so much shorter. Hillman finds the yet smaller seeds of a native dodder in American alfalfa seed.

241 Field Dodder, Alfalfa Dodder (A) **Cuscuta arvensis* Beyr. This species and the preceding both occur freely upon alfalfa and clover and especially in commercial alfalfa seed; the seeds of field dodder are distinguished from clover dodder by their double size. The vegetative characters of the species are scarcely distinguishable to the ordinary observer. Dodder seeds are so liable to occur in alfalfa seed which has not been recleaned, that is wiser to insist upon recleaned seed when purchasing. Unfortunately, moreover, recleaning does not insure the removal of all the large seeds of this dodder; some will usually remain in badly infested samples of seed. The dodder problem in alfalfa growing requires care and close examination of seeds purchased and of newly seeded areas.

Seeds the largest of our clover infesting dodders, rusty-yellowish to brown, roughened, irregularly spherical, about 1-16 inch long, occurring in seeds of clover and alfalfa. See seed cuts. The still larger seeds of a native dodder come in western alfalfa seed.

In dealing with dodder patches in either clover or alfalfa, it is best to take the areas as early as possible, dig up thoroughly all plants in them, to slightly beyond limits, and to burn, in situ, the dried remains in order to destroy the dodder seeds. Some time may elapse before reseeding, which will be desired in alfalfa fields. By surrounding the infested area with a shallow furrow, some inflammable material may be spread after which the torch may be applied for the destruction of the dodder seeds. This method may still not succeed unless the plants have been killed and permitted to dry. The digging method has been tested and found effective.

242 Onion Dodder, Wild Dodder (A) *Cuscuta Gronovii* Willd. This is a wild species often seen growing over weeds and bushes along streams. It attacks onions and other plants in cultivation about its native haunts. Clearly the way to control this dodder is to destroy all of it upon its wild hosts by a free use of scythe and torch.

WATERLEAF FAMILY, HYDROPHYLLACEÆ.

243 Phacelia, Miami Mist (B) *Phacelia Purshii* Buckl. Miami mist is a pretty, blue-flowered weed growing, as if annual, upon dry or gravelly soils. It has hairy, branched stems about a foot high, with 2 to 9 lobed leaves and light blue flowers having fringed petals; it is quite a serious garden pest in the situations named.

Seeds rusty brown, the shape of a quarter sphere, 1-8 to 1-16 inch long, surface minutely pitted all over as if rust eaten. Cultivation and seed destruction are essential in dealing with this weed.

BORAGE FAMILY, BORAGINACEÆ.

244 Indian Heliotrope (A) **Heliotropium Indicum* L. This plant has hairy stems, and quite large, wavy margined leaves on long hairy footstalks. The flowers and nutlet fruits are borne in slender, partly coiled spikes, suggesting the staminate spikes of ragweed in appearance. Locally introduced in waste places, and destroyed as other annuals. Seeds in ribbed nutlets.

245 Hound's-tongue, Dog-bur (B) **Cynoglossum officinale L.* Hound's-tongue is an offensive smelling, leafy, field and wayside weed with mullen-like, though smoother leaves and small red-purple, partly concealed flowers at the ummit. The flowers are succeeded by rather broad, rounded burs which adhere to clothing and to animals. It is a common weed in waste places. Burs about 1-4 inch long, nearly as wide, with one flat side and very numerous short spines. Destroyed like other biennials, by deep cutting in fall or early spring.

246 Beggar's-lice (A) **Lappula Lappula* (L.) Karst. A grayish weed with small, blue flowers, narrow, hairy leaves and bur-like fruit. This is found in some sections quite abundantly. To be treated as the preceding. Another plant, also called beggar's-lice, *Lappula Virginiana* (L.) Greene, is found in thickets and upon the borders of woods. This is a biennial with similar flowers and other like characters.

FIG. 46. Wheat-thief.

247 Wheat-thief, Pigeonweed, Redroot, Corn-gromwell (A) **Lithospermum arvense* L. Wheat-thief also called stoneseed and pigeonweed is a troublesome winter annual especially in the northern and northwestern part of Ohio. The cut, Fig. 46, will give some idea of the appearance of the plant and its manner of flowering. It is from 6 to 12 inches high, leaves narrow, without veins, the whole hairy, rough and grayish. The flowers are small, white to cream color, seated in a leafy cluster, opening in March or April, and soon followed by the seeds, which often drop off below while the plant is blossoming above. An exasperating pest, especially in wheat fields where little opportunity is afforded to destroy it without destroying the crop.

Seeds hard and stony, gray to dull brown, 1-10 inch long, roughened, conical, with narrow base; shown Fig. 46 *a* and *b*, the latter x 6. Frequent in wheat, in clover seed and in hay. These seeds no doubt retain their vitality

for a long time. To destroy wheat-thief the plants must be uprooted very early commonly the efforts to prevent it from seeding are begun only after the seeds are matured. Cultivation and hand pulling are good means of destroying the weed. It may be better to break up a badly infested wheat field in early spring than to seed the field indefinitely with the pest.

248 Puccoon (P) *Lithospermum canescens* (Michx.) Lehm. Is a softly hairy plant, 1 foot or less in height, with blunt, narrow leaves and bright yellow flowers. It has a deep, reddish root and grows chiefly in sandy or dry soils. Destroyed by deep cutting.

249 Comfrey (P) **Symphytum officinale* L. This comfrey is a large-leaved, deep-rooted, rough plant of the family, somewhat generally introduced in waste places. The flowers are cream to purplish, succeeded by brown nutlets. Destroyed by deep cutting.

250 Blueweed, Viper's-bugloss (B) **Echium vulgare* L. Is a rough, bristly, thistle-like, introduced weed, shown in Fig. 47. It has rather a deep root and a great abundance of prickly hairs, ready to become detached upon touching. Handling blueweed affords as much after pastime as a like engagement with prickly-pear (cactus). This character engages for this plant an abundance of room. Blueweed, also called blue-devil, is found sparingly along railways and by roadsides, occasionally also in fields.

FIG. 47. Blueweed. (*After Vasey.*)

Seeds much resembling those of wheat-thief, but with broader base and angular body, 1-8 inch long. The intensely bristly character of this weed calls for destruction wherever it appears. It should be cut out with hoe or mattock in early spring.

VERVAIN FAMILY, VERBENACEÆ.

251 Narrow-leaved Vervain (P) *Verbena angustifolia* Michx. Is a low perennial on prairie soils in northern Ohio. It has a deep root, narrow, tapering leaves and dense spikes of purplish flowers. The seeds as in the other vervains, are brown, short, slender, in clusters of four. Eradicated by the use of the hoe or by cultivation.

252 Bracted Vervain (P) *Verbena bracteosa* Michx. Is a similar perennial plant with cut or three-cleft leaves and leaf-like bracts among the flowers. Occurs in southwestern Ohio, where it may be destroyed if dealt with throughout the season.

253 Blue Vervain (P) *Verbena hastata* L. A tall plant, 4 to 6 feet high in moist ground. It has blue flowers borne in distaff-clusters at the summit. This is an unsightly weed, somewhat mildew covered as the next, and requires free use of hoe or mattock to be rid of it. Seeds by fours, brown, commonly adhering together; singly, slender, with two straight and one curved side, 1-16 inch long.

254 White Vervain (P. *Verbena urticifolia* L. White vervain is a common weed, 3 to 5 feet high, in fields and by roadsides. It has white flowers, in slender branching clusters, oval leaves which are stalked, coarsely saw-toothed and pointed. There are few other plants so commonly covered with the leaf mildew fungus, *Erysiphe Cichoraceārum* DC., as is white vervain. This fungus also infests phlox, ragweed and a wide range of hosts. Seeds like the last, frequent in clover and grass seeds.

The ever present mildew on this weed makes it a conspicuous and eye-offending pest that may be, and certainly if appearances count, will be destroyed by cultivation or grubbing.

MINT FAMILY, LABIATÆ.

255 Peppermint (P) ******Mentha piperita* L. and **256 Spearmint** (P) ******Mentha spicata* L., are two well known plants, prefering to grow in moist places, yet capable of growing wherever planted. The peppermint has a pungent, agreeable smell and taste, while the spearmint has a sickening taste. Both spread freely as do many of the plants of this family, by underground stems, any piece of which propagates a new cluster of plants. My attention has recently been called to bottom fields overrun with spearmint. Once thus infested the reclaiming is difficult as is well shown where areas have been seeded to peppermint for oil production. Certainly these two mints should be restricted and their spread prevented by hoe and salt or by other efficient means. Neglect of a small tract may mean the surrender of a large area in later years.

257 Water-horehound, Bugleweed (P) *Lycopus* spp. These are weeds of wet places; they have square and even sharply angled stems and more or less cut or saw-toothed leaves. Unsightly plants along ditches, they call for frequent mowing.

258 Pennyroyal (A) *Hedeoma pulegioides* (L.) Pers. Is a low, branching, hairy weed, growing commonly in the shade of stumps and fences. The leaves are small and pleasantly aromatic. This little plant sometimes overruns pastures and field borders. Fire can, perhaps, well be used to destroy dead plants and seeds in the fall. The seeds are small, ovoid, 1-32 inch long and frequent in red clover seed.

259 Basil, Calamint (P) ******Clinopodium vulgare* L. Is an erect, hairy plant, 1 to 2 feet high, with egg-shaped leaves and pale purple flowers appearing in globular clusters. This grows abundantly in field borders and by roadsides, gradually becoming introduced from the west. To be cleaned out annually.

260 Catnip (P) ******Nepeta Cataria* L. Is a very common, upright branching mint with deeply scalloped leaves, whitish underneath. Seeds like those of all mints, in clusters of about four, brown, with two rather straight and one larger curved side, about 1-20 inch long, having two distinct white parts to the scar near one end of the seed. Killed out by digging or close hoeing.

261 Ground Ivy, Gill (P) ******Glecoma hederacea* L. A very pretty creeping or trailing plant, with round, kidney-shaped, scalloped leaves and reddish-blue flowers, see Fig. 48. This forms a dense growth of leaves and stems above, and stems below the surface of the ground, occupying it to the exclusion of better plants; another of the cultivated pretty flowers which prove almost impossible to kill out where well established. There can be no doubt as to its ranking among the very worst weeds and it is rapidly becoming prevalent in fields and by roadsides.

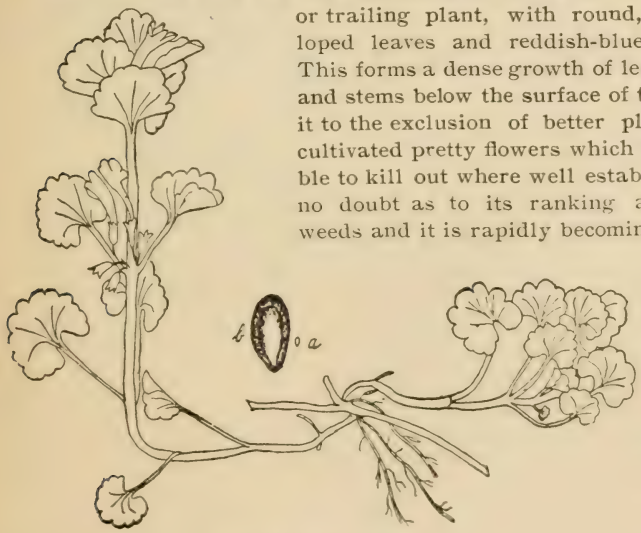

FIG. 48. Ground-ivy.

Seeds brown, resembling those of catnip, about the same size but with more of the grape-seed appearance about them, apparently not found in large numbers. The seed is shown natural size, Fig 48 *a*, enlarged six times

48*b*. This pretty thing is as difficult as horse-nettle or Canada thistle to eradicate; where fields become infested, fences should be removed and continuous cultivation be practiced. There is no middle ground with weeds of this class, they must be destroyed utterly or they take full possession of the fields. When dooryards and lawns are infested the same cultivation may be used, since hand digging will not destroy them.

262 Heal-all, Self-heal (P) **Prunella vulgaris* L. Is a common plant in low, grass land and by roadsides, growing about a foot high, with egg-shaped to oblong leaves and violet-blue flowers in a dense head. Seeds brown shaped like a grape seed, 1-16 inch long, half as wide, smooth, shining, with a few darker lines lengthwise of the seed; not rare in hay. To be killed by free use of hoe.

263 Horehound (P) **Marrubium vulgare* L. Commonly grows about a foot in height, having round, egg-shaped, stalked, scallop-toothed leaves and dense heads of small, white flowers about the base of the leaves. The heads are prickly later from the teeth of the calyx. The whole plant is whitish-woolly and bitter aromatic. Frequently found in fields and waste places.

Seeds straw color to brown, broader toward one end, somewhat triangular with the characteristic shape of the mints, 1-12 of an inch long. While useful in domestic medicine, perhaps, horehound should be killed out in fields and waste places.

264 Hedge-nettle (P) *Stachys palustris* L. Growing frequently in wet ground along ditches and the borders of swamps, two to three feet in height, with four-angled stems and numerous, scalloped, saw-toothed leaves. Flowers are very small, clustered in the angles of the leaves. It is an unsightly weed, killed out by cutting or cultivation after sufficient drainage to permit the growth of grasses.

265 Wild Sage (P) **Salvia verbenacea* L. Wild sage is locally naturalized and may be recognized by its hairy stems and cut-tooothed leaves. It requires close cutting to destroy the plants.

266 Motherwort (P) **Leonurus Cardiaca* L. Motherwort is a common, tall perennial weed with its four-sided stems, lower rounded and upper finger-lobed leaves. The pale, bearded flowers are in clusters at the base of the leaves.

Seeds dark, sharply triangular with one curved side, the flat top covered with hairs, 1-12 of an inch long, somewhat shining. Best killed out by cultivation; may be destroyed by repeated cutting with hoe or by the free use of salt.

267 Dead-nettle (A) **Lamium amplexicaule* L. Dead-nettle is a recently acquired winter annual or biennial weed against which a sharp warning is needed. It has low stems, rounded, scalloped leaves clasping the stem and bright red-purple flowers in whorls at the top, see Fig. 49. It is becoming very frequent in lawns and gardens, proving aggressive in both situations. It should be watched for and eradicated upon its appearance. Two other species are of local occurrence. Also called henbit.

FIG. 49. Dead-nettle.

Seeds gray, curved, triangular, 1-20 of an inch long, with whitish markings over the surface. Promising to become as omnipresent as those of peppergrass. Enough has been said of this to show the urgent necessity of prevention and destruction. The plant begins to blossom by March and forms its seeds very early, thus making promptness necessary. It should be treated as recommended for peppergrass and shepherd's purse by growth of a winter crop of some sort and by thorough cultivation.

268 Blue-curls, Bastard Pennyroyal (A) *Trichostema dichotomum* L. This is a light green, low plant, with fine, sticky down, oblong, tapering leaves and blue flowers in late summer. It is common in the dry fields of southeastern Ohio where it seems to do little damage as a weed.

269 Wood-sage, Germander (P) *Teucrium Canadense* L. A very conspicuous weed in grass lands by roadsides, with its downy stems one to three feet high, egg-shaped, saw-toothed leaves, rounded at the base and conical flower clusters of rose-colored, purple dotted flowers at the summit. It merits destruction by cutting or grubbing.

POTATO FAMILY, SOLANACEÆ.

270 Apple-of-Peru (P) **Physalodes physalodes* (L.) Britt. This is a tall, Peruvian annual, two to three feet high, with smooth leaves somewhat resembling those of jimsonweed. The flowers are pale blue and the fruit similar to those of the ground-cherry, except that the covering becomes bladder-like and five wing-angled. A suspicious plant, recently introduced; it should be pulled up wherever seen.

271 Ground-cherries (A and P) *Physalis* spp. The various ground-cherries, with their egg-shaped leaves and downy or sticky branches, are frequent in waste places and in grass lands. They commonly have greenish or yellowish flowers, succeeded by a pulpy, many seeded berry, enclose by a loose husk. The annual may be distinguished from the perennial sorts by the difference in the roots. All of them save the cultivated annual one with yellow, edible berries, deserve to be destroyed. The perennial sorts have deep, spreading roots.

272 Horse-nettle, Sand-brier (P) *Solanum Carolinense* L. No list of the vilest and worst weeds of the state would be complete without including the horse-nettle, a southern species much resembling the potato in leaf characters but with leaf and stem bearing stout, straw-colored prickles. Fig. 50 shows the appearance of this plant when in blossom and also shows the spreading, underground stems by which it gradually extends its growth each year. It is commonly a foot in height, with purplish or white blossoms, followed by round, yellow berries about 1-2 inch across. These berries are many seeded and strongly resemble those of the potato. The resemblance of the plant to the potato in general appearance, together with the prickles on the stems and leaves and the underground stems, make identification rather easy.

FIG. 50. Horse-nettle.

The weed has spread over all counties of the state, and in the south and southeastern areas it ranks with any other weed in noxious character. It is particularly annoying in permanent pastures where it flourishes in all sorts of soils. The berries are, according to a Meigs county correspondent, commonly produced in abundance, and the sheep feed upon them carrying the seeds to the higher land, thus spreading the pest widely. If choosing between it and the Canada thistle, the wind carried seed of the thistle is the only point to make it worse than horse-nettle; this point is almost offset by the fact just stated. Yet horse-nettle has been permitted to spread over many thousands of acres of grass lands and along many miles of roadside. It should certainly be included among the weeds in a state law.

Seeds straw color, flat, round to egg-shaped, 1-10 inch long, smooth, liberated by the decay or opening of the berry. To destroy horse-nettle the underground stems must be starved out. For this purpose, especially in pastures, but few methods of destruction can be used. If cut off with the hoe and then salted freely as often as the plants show green leaves, stock will seek the salt and materially assist in the destruction of the young plants, while of itself the salt and cutting tend to destroy them. Two or three seasons of continuous care will be needed to kill out the horse-nettle. Kerosene and sulfuric acid may be used instead of salt, but do not invite the stock to assist.

273 Bittersweet (P) **Solanum Dulcamara* L. This climbing, perennial, European plant has heart-shaped lower and halberd-shaped upper leaves (leaflets) with two ear-like lobes at the base, and purple or bluish flowers in small clusters, followed by oval red berries. It has become introduced in waste places and especially about old dwellings. It should be destroyed to prevent its spreading. The plant is said to be poisonous. Seeds almost circular, flat, with rough-pitted surface; occurring in European alfalfa seed.

274 Black Nightshade (A) *Solanum nigrum* L. Black nightshade is a common weed about dwellings. It has low, smooth, branched stems, egg-shaped wavy-toothed leaves, white flowers and black, globular berries. The plant is very poisonous and children are at times poisoned from eating the berries. Safety demands the destruction of this weed.

275 Buffalo-bur, Sand-bur (A) **Solanum rostratum* Dunal. A prickly fruited, potato-like plant, is a recent introduction from the plains of the west. It is commonly very prickly, 1 to 2 feet high, with prickly, light-colored leaves, resembling those of the potato in shape and having the berry enclosed in a densely prickly covering; flowers yellow, root annual. A few years ago the first of this weed for Ohio was discovered about the grounds of Sells Brothers circus, near Columbus, since that time it has been scattered in western seeds, in hay and the like, to many parts of the state. One correspondent aptly described it as looking as if it were a cross between the thistle and the potato.

Seeds black or greenish, commonly kidney form, angled, 1-10 inch long, the coat pitted all over with bubble-like pits or cavities. Frequently distributed in western seeds and hay. Buffalo-bur may easily be recognized by its prickly fruit and its resemblance to the potato. It should promptly be pulled up wherever found and burned.

FIG. 51. Buffalo-bur.

276 Matrimony Vine (P) **Lycium vulgare* (Ait. f.) Dunal. This is a woody vine, frequently with spines. and often escapes to borders and waste places. The orange-red berries are characteristic. Killed by frequent cutting.

277 Black Henbane (P) **Hyoscyamus niger* L. This sticky, narcotic, poisonous herb, somewhat resembles the following sorts, but has smaller flowers. Even more dangerous than jimsonweed. Destroyed by cutting.

278 Jimsonweed, Jamestown-weed (A) **Datura Stramonium* L., and **279 Thorn-apple** (A) **Datura Tatula* L. Fig. 52 shows a branch of one of these weeds with blossom and prickly fruit. Both have large, scallop-toothed leaves and funnel-shaped white or purple flowers. The common name of these weeds is by reason of their early introduction at Jamestown, Virginia.

Seeds black, kidney form, 1-8 inch long, wrinkled and finely pitted over the surface. These weeds should be pulled out wherever found as they are dangerous. Children gathering plants have been poisoned from eating the leaves.

FIG. 52. Jimsonweed. (*After Millspaugh.*

FIGWORT FAMILY, SCROPHULARIACEÆ.

280 Mullen, Woolly Mullen (B) **Verbascum Thapsus* L. It is a tall plant, 3 to 6 feet high, with large whitish, woolly leaves and dense clusters of yellow flowers; common in sandy pastures and waste places. It should be cut off below the crown with hoe or mattock; if this is done in fall or early spring the plants may soon be destroyed.

281 Moth-mullen (B) **Verbascum Blattaria* L. Moth-mullen, Fig. 53, deserves to rank among the very worst weeds of timothy meadows, since the small, brown seeds are so common among the seeds of this grass as well as in clover seed. The plant is smooth, with a dense rosette of dark green leaves, from which springs a tall flower-stalk with woolly, yellow or white flowers followed by globular pods of the size of peas. Very frequent in meadows and by roadsides. The universal testimony about this weed is "I found it in a newly seeded meadow." Seeds very small, brown, about 1-40 inch long, like the lower part of a hexagonal pyramid, with sides alternately pitted, see weed cuts. Very frequent in seeds of timothy and similar seeds of grasses. To be cut out in early spring with hoe or spud.

FIG. 53. Moth-mullen.

282 Toad-flax, Butter-and-Eggs, Ranstead (P) **Linaria Linaria* (L.) Karst. This is another one of the "posies" that soon prove to be weeds. Commonly planted about pioneer cabins and public cemeteries for ornament, this weed, unless destroyed, will spread over fields and waysides. It grows in dense tufts with low, erect stems, narrow leaves and bright yellow, spurred flowers, Fig. 54. It produces seeds abundantly, and propagates itself without limit by its underground stems. I have seen the sloping grassy hillsides and waysides of central Pennsylvania dotted for miles with this weed; once upon a farm it spreads to every corner, infesting all fields to their permanent damage. Thus far in Ohio it is chiefly limited to patches here and there, but as surely as it is neglected for twenty or thirty years more, so surely will many of the fields of the state be hopelessly overrun by it.

Seeds black, with wing, the whole 1-12 inch across, see Fig. 54*a*, which represents it enlarged several times. Present in seeds and hay from some districts. Toad-flax, like horse-nettle, requires persistent and vigorous labor to destroy it. It may be killed out by continuous cultivation, but is much more likely to spread through the breaking and spreading of the under-ground stems, Use of the hoe and some plant destroyer such as coal oil, salt or sulfuric acid, following the cutting will be found efficacious, if continued for two or more seasons. In pastures, it goes without saying, that salt would invite other assistance in the destruction. The weed should not be transplanted for ornament.

FIG. 54. Toad-flax.

283 Figwort (P) *Scrophularia Marylandica* L. This is a tall, smooth plant, 3 to 5 feet high, with foursided stems and very large, pointed, saw-toothed leaves. It is common in low, rich bottoms and along ditches.

Seeds dull brown, 1-32 inch long, deeply grooved and wrinkled-roughened. Figwort may be killed out by persistent grubbing. Where abundant, the roots, which are an officinal remedy, might be sold to repay the cost of digging them.

284 Foxglove Beard-tongue (P) **Pentstemon Digitalis* (Sweet) Nutt. Is a western, smooth annual 3 to 4 feet high. It has long, tapering, smooth leaves with clasping base and large, tubular, inflated, whitish flowers commonly striped with purple. These are borne in dense clusters at the top of the stem. The seeds of this plant which are irregularly angular about 1-20 inch long, have been introduced into many counties of Ohio during the past few years in western grass seeds and in grain. It may be killed out by digging it up, otherwise our own grass seeds will soon become infested.

285 Corn-speedwell (A) **Veronica arvensis* L, **286 Purslane-speedwell** (A) *Veronica peregrina* L, **287 Thyme-leaved Speedwell** (P) *Veronica serpyllifolia* L, and **288 Fieldspeedwell** (A) *Veronica agrestis* L. These are small, weedy plants, 4 to 8 inches high, with rather pretty flowers along the tips of the branches. All except the last named are found nearly everywhere in gardens, in lawns and by roadsides. They grow in early spring, blossoming and seeding with chickweed and shepherd's-purse, and requiring the same severe methods for their destruction. The last named is less general but of the same character.

289 Common Speedwell (P) *Veronica officinalis* L. This is a downy, prostrate, stem-rooting plant of dry banks, with elliptical leaves 1-2 to 2 inches long, and short spikes of rather pretty, blue flowers.

BROOMRAPE FAMILY, OROBANCHACEÆ.

290 Louisana Broomrape (A) *Orobanche Ludoviciana* Nutt., and **291 Hemp-Tobacco Broomrape** (A) **Orobanche ramosa* L. These two species are of interest in Ohio, since the first has already attacked tobacco, in Clermont county, apparently passing from wild plants, while the second is a pest upon hemp and tobacco in Kentucky. A third species, **292 Clover Broomrape** **Orobanche minor* J. E. Smith, occurs upon clover roots in Europe and in the Eastern United States. Seeds of all small, but the hemp species likely to occur in hemp seed.

BIGNONIA FAMILY, BIGNONIACEÆ.

293 Trumpet-creeper (P) *Tecoma radicans* (L.) DC. Is a woody, climbing vine with 9 to 10 leaflets and clusters of tapering, scarlet flowers, 2 1-2 to 3 inches long, handsome in cultivation, but a serious pest when in fence-rows and waste places. It requires repeated grubbing to destroy it, and this treatment is deserved when aggressive.

PLANTAIN FAMILY,

PLANTAGINACEÆ.

294 Bracted-plantain (A) **Plantago aristata* Michx. Bracted-plantain is comparatively a new weed in Ohio, and has attracted much notice during the past few years. It has apparently been widely introduced through the use of western seeds and forage. It commonly grows less than a foot high with rather long, narrow, pointed, ribbed leaves and naked flower-stalks, bearing long clusters of flowers intermingled with short, narrow leaves (bracts), hence the name. See Fig. 55. It most resembles the narrow plantain. The weed appears thus far to have been less aggressive than either the broad or narrow plantain, but has become so widely diffused that it may be expected to prove well suited to certain soils.

FIG. 55. Bracted-plantain.
(*After Dewey, Bulletin 28, Division of Botany, U. S. Dept. Agric.*)

The seeds are dark brown, rounded at the ends and on one side, flat, grooved lengthwise on the other, 1-10 inch long with a transverse groove midway across the smooth, rounded side. (See Fig. 55*d*.) Distinguished from the seeds of narrow plantain by this transverse groove. Very frequent in clover and timothy seeds from west of the Mississippi. This is rather a short lived plant, a winter annual or biennial, which can best be removed through cultivation or by hand digging in the spring. The methods of control are much like those of the narrow plantain, while it promises to be less noxious.

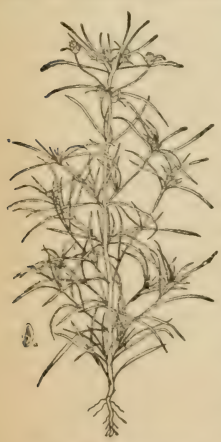

FIG. 56. Sandwort-plantain.

295 Sandwort-plantain (P) **Plantago arenaria* L. This is the latest importation from Europe, represented in Fig. 56, which is drawn from a specimen collected in Dayton, Ohio, by the late Bro. H. Jaske, a careful collector. The leafy stems are much taller, the resemblance to the other plantains being suggested only in the narrow, ribbed leaves and in the flower clusters. It is illustrated that it may be distinguished should it appear elsewhere. Its possibilities as a weed can hardly be predicted. From what we know of the others the destruction of the plant as a weed would be a safe measure.

Seeds shown in Fig. 56, almost oval, 1-12 inch long, black, with one flat, grooved, and one rounded, smooth side. Apparently brought in packing from Europe.

296 Narrow Plantain, Buck-plantain, Buckhorn, Ribgrass (P) ******Plantago lanceolata* L. Narrow plantain, Fig. 57, ranks among the worst weeds, particularly upon light, sandy soils. It is apparently not so exclusive as sorrel in choosing to grow only upon sandy lands, but its most aggressive and injurious characters will show over the same regions as those outlined under sorrel and broom-sedge. The leaves of this weed are narrow and tapering, with prominent veins (ribs) running lengthwise. The flowering stems are commonly about a foot high, with leafless spikes (heads) of flowers succeeded by an abundance of seed. I have seen some fields hopelessly infested with it. For such only the greatest care and persistence can bring relief. For most districts it comes largely in hay and in grass and clover seeds. In all these districts it will be possible by vigorous measures to control the pest.

FIG. 57 Narrow Plantain. (*After Millspaugh.*)

Seeds brown, oval in outline, rounded at the ends and on one side, hollowed and grooved on the other, about 1-10 inch long, smooth and somewhat shining. A very frequent impurity in clover and alfalfa seeds where it occurs often with bracted-plantain. It is distinguished from the latter by the absence of the transverse groove across the back and the more shining coat. The first measure in all cases is to avoid distributing the seeds of narrow plantain. But once having it, methods of destruction must be vigorous and persistently followed. If a few stools only are found these may be removed by hand digging. For this purpose a narrow hoe or spud is a good tool. But where a field has a considerable quantity scattered about, it would be best to plow promptly and cultivate until the plants are destroyed. In every case no plant should be permitted to form seeds. Newly seeded clover fields should be inspected to ferret out any of this or of other weeds. In lawns where dense tufts of it occur mere mowing will not suffice and it will generally prove cheaper to spade up and resod. The thickened rootstocks of this weed must be thoroughly removed in all efforts in digging and cultivation.

297 Plantain, Broad Plantain (P) ******Plantago major* L. and **298 Rugel's Broad Plantain** (P) *Plantago Rugelii* Decaisne. The broad plantains are annoying weeds, more particularly in manured land. They have thick rootstocks like the last, broad, oval, ribbed, green leaves and the latter one named, very long tapering spikes of flowers and seeds. In enriched fields seeded to clover and the like, the broad plantains are frequently serious pests; they are ever present about yards and waste places. The recognition of the plants is not a difficult matter, but the recognition of the seed is all essential since it is so frequently an impurity in clover seed,

Seeds dark brown to black, very irregular in shape, with rounded back and variously flattened; sloped or angled on the other side, 1-12 inch long or less, by about one-half as wide. Very common in clover seed. It is suggested that interested persons collect this seed to keep for comparison with the apparent dark fragments in clover seed. The seeds may be otherwise passed by for some particle of dirt in the seed. The broad plantains may be removed by hand from yards and lawns. In clover fields continuous cultivation is required. This will be the same as that recommended for mustards in clover.

MADDER FAMILY, RUBIACEÆ.

299 Button-weed (A) *Diodia teres* Walt. This a low plant with rough stems and small, rough, narrow, opposite leaves. The flowers and seeds are borne in the leaf angles (axils). This species, long abundant in the Atlantic coast region is now found also in Ohio. Its weedy character is to be determined here. The stony seeds are wedge-shaped, about 1-8 inch long by half as broad and somewhat rough on surface.

300 Bedstraw, Cleavers, Goosegrass (A) **Galium Aparine* L. This is a weak-stemmed, prickly-angled plant, trailing over other plants and over bushes. It is found in damp thickets and along fence-rows. The seeds mature and drop early, so that where troublesome it is best controlled by taming the land and crowding it out with grasses. Seeds rough, apple-shaped with one sunken cone, about 1-8 inch in diameter.

HONEYSUCKLE FAMILY, CAPRIFOLIACEÆ.

301 Common Elder (P) *Sambucus Canadensis* L. The common elder has dark purple berries in large, flat clusters, following the somewhat showy blossoms; the pithy, woody stems are easily cut and broken, but the spreading roots are much more difficult to destroy, since they spread and send up new shoots on slight provocation. The roots in this case, like the underground stems of horse-nettle, require to be starved out by repeated cutting or dragged out by cultivation. Seeds spread by birds attracted by the berries.

VALERIAN FAMILY, VALERIANACEÆ.

302 Lamb-lettuce, Corn-salad (A) *Valerianella radiata* (L.) Dufr. This is a low, white-flowered, pale weed, with two-forked, branching stems and growing in wet grass lands. It is mentioned here more by reason of its abundance than because of any especially noxious character.

TEASEL FAMILY, DIPSACEÆ.

Fig. 58. Teasel. (*After Millspaugh.*)

303 Teasel (B) **Dipsacus sylvestris* Huds. Teasel, Fig. 58, is by no means a rare roadside weed. Its large prickly leaves and awned heads are very conspicuous. It grows like the common thistle, and like it flourishes through neglect. It often infests fields, but is more generally a weed to demand the attention of the road supervisor.

Seeds, brown, four sided and somewhat angled, ends almost flat, 1-6 inch long, with a rib lengthwise in the middle of each side. Teasel, like any other biennial, may be readily destroyed by deep cutting or grubbing in early summer. The use of the hoe would greatly improve the appearance of many roadsides.

BELLFLOWER FAMILY, CAMPANULACEÆ.

304 Creeping Bellflower (P) **Campanula Rapunculoides* L. This bellflower is becoming more widely scattered. Its leaves are ovate, pointed and scallop-toothed, while the flowers are scattered along the upper portion of the stem. The plant spreads by rootstocks and may be destroyed as other plants propagated in the same manner.

305 Venus's Looking-glass (A) *Specularia perfoliata* (L.) A. DC. Is a low plant, 4 to 18 inches high, with roundish, toothed leaves clasping the stem, and bluish-purple flowers sitting in the cups. A frequent weed in open, rather sterile ground. It should be pulled up before seeding if found obnoxious.

306 Lobelia, Indian Tobacco (A) *Lobelia inflata* L. Is a low weed, 1 to 1½ feet high, much branched, somewhat hairy, with egg-shaped, blunt-toothed leaves and small blue flowers, followed by inflated, seedy pods. It is very common in dry fields and in pastures generally. This is a very poisonous plant, much prized in domestic medicine as an efficient emetic. It may be pulled up before flowering. The plant is so very poisonous that none but competent physicians should prescribe its use.

307 Great Lobelia (P) *Lobelia syphilitica* L. This is a hairy, single-stemmed plant, growing 2 to 3 feet high, bearing an abundance of large, thin toothed leaves, tapering to a point at both ends, and dense clusters of blue flowers at the summit. It resembles the cardinal flower except for the difference in color. Where too conspicuous this may be grubbed out with the hoe.

CHICORY FAMILY, CICHORIACEÆ.

308 Chicory (P) **Cichorium Intybus* L. Is a European plant that shows itself aggressive. Fig. 59 shows a cut of branch with its pretty blue flower heads. The root is large and deep and requires grubbing or close cutting with the hoe. It is most complained of in southwestern Ohio, where it infests the roadsides. Certainly capable of proving a great pest if permitted to escape widely.

Seeds black, somewhat four-sided, 1-12 inch long, top with fringed borders. To be guarded against by scrutiny of seeds. Like the dandelion and spinach, this plant may be used for food.

Fig. 59. Chicory. (*After Millspaugh.*)

309 Fall Dandelion (P) **Leontodon autumnale* L. This European accession much resembles the common dandelion, except that it has stiffer and longer stalks to the flowers. Becoming widely scattered in Ohio. Seeds cylindrical, elongated and transversely wrinkled.

310 Bristly Ox-tongue, Worm Salad (B) **Picris echioides* L. The seeds of this plant come to us in alfalfa seed, and are cylindrical, about 1-10 inch long, contracted to a neck above, reddish brown, and transversely wrinkled. (See seed cuts). The plant which may occur already in the state, has bristly leaves and yellow heads.

311 Purple Salsify, Oyster Plant (P) **Tragopogon porrifolius* L. and **312 Meadow Salsify** (P) **T. pratense* L. Are deep rooted plants with grass-like leaves, milky juice and purple or yellow flowers. Both have escaped from cultivation at many points and are liable to become prevalent weeds. The white mold, *Cystopus Tragopogonis* (Pers.) Schroet., grows on these and on a great variety of composites.

Seeds large, brown, 1-2 inch long, striate and tuberculed, less tubercled in last named, with long-stalked, hair-parachute. Perhaps not sufficiently buoyant, by reason of the size of the seeds, to become as prevalent as prickly lettuce. Plants destroyed by grubbing.

313 Dandelion (P) **Taraxacum Taraxacum* (L.) Karst. The dandelion is a pretty weed to look upon but difficult to destroy. It is present in lawns and pastures generally. One way to utilize the weed is to take up the roots, and place in earth in the cellar through the winter, where in early spring it will make a growth of pale leaves, unsurpassed to mix with spinach or to use alone for food.

Seeds brown, ribbed, with pappus, 1-8 inch long, contracted to a decided point, and with prickles about the base of it. Destroyed by cultivation or by hand digging with a narrow tool.

Fig. 60. Sow-thistle. (*After Millspaugh.*)

314-315 Sow-thistle (A) **Sonchus asper* (L.) All., and **Sonchus oleraceus* L. The cut, Fig. 60 shows the appearance of the sow-thistles, which have plants 2 to 5 feet high, with yellow heads of flowers, milky juice and spiny leaves. The leaves of the second are commonly much more lobed and divided, while those of the first are toothed with stiffer spines. A common weed in cultivated ground and about dwellings. Abundant in such places as corn fields that are not cultivated the succeeding spring; for example, in the unseeded shock rows of a corn-stubble wheat field. Destroyed by cutting or pulling.

Seeds brown, somewhat oval, thin, 1-8 inch long, striate. Those of *Sonchus oleraceus* also transversely wrinkled.

316 Field Sow-thistle (P) **Sonchus arvensis* L. Is a perennial sow-thistle, somewhat shorter than the preceding, with similar leaves but larger, bright yellow heads. These and the perennial root will serve to distinguish it from the two preceding. It has been introduced about Cleveland, Painesville and Cincinnati and perhaps at other places.

Seeds as those of *S. oleraceus* but less flattened, transversely wrinkled on the ribs. The field sow-thistle requires close hoe cutting or digging to destroy it This weed promises to compare with dandelion in lawns and parks, yet it is a taller stemmed plant.

317-318 Wild Lettuce (A or B) *Lactuca Canadensis* L. and *L. sagittifolia* Ell. These are tall growing, yellow-flowered plants of fence-rows and open woods. They have rather deep roots and a milky juice. While freely eaten by stock the plant is by no means ornamental, deserving to rank as a weed, but in no wise comparable to the next in aggressive characters. Besides the common form with lobed leaves there is also the one with entire leaves. See Fig. 61.

Fig. 61. Wild Lettuce. (*After Millspaugh.*)

Seeds brown, flat and ribbed, narrowed above as those of cultivated lettuce, 1-6 inch long and having pappus. They may be destroyed by cutting with scythe before the blossoms open. Now included in the weed law under the name assumed to apply to prickly lettuce.

319 Strong-scented Lettuce (A) **Lactuca virosa* L. This lettuce is illustrated in Fig. 62. This plant has spines or prickles on the midribs and margins of the entire leaves and upon the stem below. Its milky juice, yellow heads of flowers and other characters resemble those of cultivated lettuce. The weed is an introduction, coming to us from Europe and appearing, as to this species, in Ohio about 1878 or 1879. Since that time it has spread to every county of the state and apparently into their most remote corners. This species to northward; in southwest see next. It is a winter annual, starting from seed in the fall and reaching early maturity the succeeding season. It infests clover fields, completely destroying their value and is an omnipresent weed if neglected. Treated of in Bulletin 44 of this Station. Apparently the weed intended to be designated by the term "wild lettuce" in the Ohio weed law. Heretofore confused in specific name; this name, *virosa*, refers to reputed poisonous character.

FIG. 62. Strong-scented Lettuce.

Seeds brown, widening upward, ribbed, 1-8 inch long and about one-third as wide, suddenly contracted into a narrow neck, provided with an abundant pappus and carried long distances by the wind, the chief method of dissemination.

While this weed cannot now be exterminated it may yet be subdued. If prevented from seeding in most places it will decrease in numbers and aggressiveness. Where mown the plants stool freely and so must be either cut with hoe or pulled to prevent altogether the ripening of seeds. Community of effort will be most effectual in limiting its spread.

320 Prickly Lettuce (A) **Lactuca Scariola* L. This is the sort with lobed leaves, otherwise it resembles the entire-leaved or preceding species. For many years this one with lobed leaves was very scarce northward, while abundant in the region of Cincinnati. In weedy characters the two belong under the same head. The specific name in this case alludes to the prickles. Seeds like those of the preceding.

Fig. 63. Willow Lettuce.

321 Willow Lettuce (A) **Lactuca saligna* L. The willow lettuce is a very slender plant, see Fig. 63, without prickles and with pinnatifid leaves. It was first noted by the writer near Dayton, O., in 1898, being in great abundance to southward of that city. Since that time it has become scattered over the western and central parts of the state and perhaps more widely.

Seeds resembling those of *L. virosa* but slightly smaller.

322 Hawksbeard (A) **Crepis tectorum* L. This species of hawksbeard together with the biennial sort has become introduced to spread as a weed. The flowers are yellow while the tall flower-stalk resembles that of fall dandelion. The plants have buoyant, ribbed seeds.

323 Golden Hawkweed, Orange Hawkweed (P) **Hieracium aurantiacum* L. The cut, after Dr. Vasey, Fig. 64, shows the characters of this plant. It spreads by runners as well as by seeds. The flowers range from deep orange to flame color. This is a serious field pest, described by Prof. L. R. Jones as unquestionably the worst of recent invaders in Vermont. It has

reached northeastern Ohio, having been collected by correspondents in the northeastern part of Orwell township, Ashtabula county, at Cherry Valley, Williamsfield and Lindenville, same county, at Thompson's Ledge, Geauga county and also received from Columbiana, Columbiana county, and Alliance, Stark county. In all these localities it does not appear that there are more than a patch or two of the weed.

Seeds cylindrical, black, one-twelfth inch long, ribbed, with slight tawny pappus. The work upon this weed in Vermont leads Prof. Jones to recommend salt at the rate of one or two tons per acre, which kills the weed without seriously injuring grasses. It should be exterminated in each locality if possible.

Fig. 64. Golden Hawkweed. (*After Vasey.*)

324 Mouse-ear Hawkweed (P) **Hieracium Pilosella* L. This hawkweed has appeared in Lake county and calls for mention. It propagates by stolons, has hairy parts and a scape or stalk with a single flower. Probably more a weed of waste places than of pastures, but merits watching.

325 King-devil (P) **Hieracium prealtum* Vill. This expressively named weed proves to be as bad as the golden hawkweed in parts of the New England States. The heads are yellow, against the orange-red of that species, while the stems are smooth and glaucous. May not as yet be in Ohio, but merits a suitable reception when appearing.

RAGWEED FAMILY AMBROSIACEÆ.

326 Marsh Elder (A) *Iva ciliata* Wild. The seeds of this and other species of Iva, native farther west and northwest, occur in alfalfa seed offered our state; the plants, accordingly, may be expected to appear.

Seeds about 1-8 inch long, nearly as broad at wider end, and within conspicuously ridge-ribbed on the face. See seed cuts. This with other species of Marsh elder to be expected in western alfalfa seed.

327 Ragweed, Roman Wormwood (A) *Ambrosia artemisiæfolia* L. Ragweed, with its divided leaves and long spikes of pollen-producing flowers, is known to most persons. It is the universal weed of Ohio grain fields, ranking with our European immigrants in its noxious character. It reappears persistently, following the grain crop, and its hard stems remain to infest the hay of the next year unless sooner removed.

Seeds dark brown, ovoid, with sharp tip, one-eighth inch long, two-thirds as thick, smooth, commonly surrounded by an urn-shaped, long-pointed covering, with six or more horn-like projections around the crown. Frequent in American clover seed, and evidently retaining their vitality for many years when buried in the soil. It is, apparently, these soil covered seeds that lie in wait for the removal of the grain crops and showery seasons thereafter.

Careful selection of seed and the free use of the mowing machine after harvest, will in time conquer even ragweed. But the victory will not be apparent until the soil balance of seeds has been exhausted through years of cultivation. Manifestly the mowing machine should be used before any seed has been formed, even before blossoming. When the weeds are thus cut down they will form a useful mulch for young grasses.

Fig. 65. Tall Ragweed. (*After Millspaugh.*)

328 Tall Ragweed, Horseweed (A) *Ambrosia trifida* L. This tall weed with its three-lobed leaves and three-forked flower clusters finds its home in fertile bottoms and roadsides. The cut (Fig. 65) shows the essential characters.

Seeds, like those of the preceding, but much larger, five-eighths of an inch long, when enclosed in the dense, pointed, five to seven horned, urn-shaped covering in which these are usually found. Ohio roadsides may certainly be freed from this weed. That can be done by annual mowing before the plants flower.

329 Western Ragweed (P) **Ambrosia psilostachya* DC. The name indicates the habitat of this as west of us; it belongs in the country described by "Illinois and westward." The weed resembles No. 327 but is perennial by running roots; the seeds are also similar. The plant is as yet local in Ohio. It may in time prove as bad as any of the ragweeds.

330 Cocklebur, Clotbur (A) *Xanthium Canadense* Mill. Fig. 66 will show the characters of cocklebur, a weed much despised by shepherds and stockmen generally. It is very common by roadsides and occasionally infests moist fields; from both places it may be removed by persistent pulling. The seeds are enclosed in the large spiny burs, two in each bur.

Fig. 66. Cocklebur. (*After Millspaugh.*)

331 Smoothish Cocklebur (A) *Xanthium glabratum* (DC) Britton. This cocklebur differs from the preceding in its rounder, slightly larger leaves and the straight, smooth beaks of the bur; ranking with it as a weed.

332 Spiny Clotbur (A) **Xanthium spinosum* L. The spiny clotbur has been recieved from Hamilton, Montgomery and Seneca counties and promises to become widespread. It differs much from the preceding in its white, hairy appearance and long, straw-colored, three-forked spines, growing in the leaf axils. It is one of the newly introduced weeds coming to us from tropical America.

THISTLE FAMILY, COMPOSITÆ.

This is one of the most abundant families of plants in our flora and is represented by a liberal supply of weeds; formerly the two preceding families were included in it. It is named the composite family from the fact that many single flowers are collected into dense heads, commonly known as the flower. Many of the species have two sorts of flowers in the head. The border ones having long, strap-shaped corollas, forming the rays of the head; they are commonly white or yellow in color and are sometimes absent. The center of the head has the disk flowers, which are inconspicuous and have tubular corollas, often differing in color from those of the ray flowers. All have a forked style and the anthers in a ring. We shall use the term "rays" to designate the flat, strap-shaped corollas of the border flowers, and the term "disk flowers" to represent those of the center of the head. The old group with milky juice and all the corollas strap-shaped is included in the chicory family. The common term petals, as applied to daisies, asters and the like, is too misleading to warrant its use in the descriptions of the list.

333 Ironweed (P) *Vernonia maxima* Small. With its tall stems, 4 to 7 feet high, large, tapering, pointed leaves and red-purple heads of flowers, the ironweed is a noticeable plant. More than this, its perennial roots makes it despised by the cultivator. This weed's favorite haunt is in moist, permanent grass lands, such as grassy hollows, bottoms and pastures. In these situations danger of washing often prevents cultivation, so that the ironweed holds its own year after year, sending up its hard woody stems. For eradication we have the alternatives of grubbing or frequent cutting off with the hoe and salting; the salting will be much more efficient in pasture lands, where its work will be extended more or less by the stock. The species given is that more commonly found; one or two other species grow in similar situations, but all have the ironweed character.

The ironweeds are attacked by several species of fungi, including the leaf mildews, *Erysiphe Cichoracearum* DC. and *Sphærotheca Castagnei* Lev.; by a downy mildew, *Plasmopora Halstedii* (Farl.), and by rusts belonging to two genera, *Coleosporium* and *Puccinia*.

334 Jopye-weed, Trumpetweed (P) *Eupatorium purpureum* L., is a very tall weed, four to ten feet high without branches and with a large cluster of reddish blossoms. The leaves are very large, growing in whorls, three to six at a joint. They are sharply saw-toothed on the margin. Jopye-weed grows in similar situations to ironweed and may be destroyed in the same manner.

335 White Snakeroot (P) *Eupatorium ageratoides* L. f. This is a smooth, branching thoroughwort, about three feet high, with broadly egg-shaped, coarsely toothed, pointed, long-stalked opposite leaves, three to five inches long. It has showy clusters of pretty white flower-heads, making a conspicuous and handsome plant, sometimes found in cultivation. It is very frequent in low, bottom pastures and along the borders of woods. Interest attaches to this weed by reason of its suggested relation to milk-leg in cattle and its reputed poisoning of sheep and of persons through use of milk from cattle feeding on it. Recent experiments by Moseley[1], sustain the reputed poisonous character of the plant.

For destruction it requires the same measures as for ironweed. Removal would be profitable compared with recurrent loss and sickness.

336 Boneset, Thoroughwort (P) *Eupatorium perfoliatum* L. If use as a domestic remedy would exclude a plant from a weed list this one would be excluded. But unfortunately it is a low, unsightly weed in moist land. It has light green, opposite leaves, whose bases unite around the stem, and small heads of white flowers. This plant was introduced into England, according to Millspaugh, as early as 1699, but was not admitted into the medical list until about 1800. It has the same character of root as ironweed and requires like vigorous treatment to destroy it. As with the three preceding, its destruction is assisted by more thorough drainage of the land in which it grows.

Thoroughworts harbor the same or similar species of fungi to those found upon the ironweed.

337 Mist-flower (P) *Eupatorium cœlestinum* L. This plant resembles No. 338 in growth, but has blue or violet rays. Occurring in the southeast and possibly elsewhere. Destroyed as the others.

338 Kuhnia, (P) *Kuhnia eupatorioides* L. Grows in cluster, two to three feet high, from a very large, deep root. The leaves are narrow, tapering and sometimes toothed, the whitish flowers are followed by seeds with very showy attached plumes. This is a very conspicuous weed in late fall, occurring in dry or prairie lands, more commonly to the northward. It is, wherever seen, usually badly rusted with *Puccinia Kuhniæ* S.

It is more easily killed by grubbing than ironweed or boneset, by reason of the single root.

[1]Ohio Naturalist. 7:463-470, 477-483 : 1906.

339 Gum-plant (P) *Grindelia squarrosa* (Pursh) Dunal. This gum-plant is a native of the plains and has recently become introduced eastward. It has been locally introduced in alfalfa and other seeds from the west. The plant is very leafy, 1 to 2 feet high, with yellow rays and sticky or glutinous bracts about the base of the heads. Seeds, light-colored, smooth, four or more angled, often ribbed and curved, about 1-10 inch long with truncate (flat) summit, occurring in alfalfa seed.

340 Golden Aster (P) *Chrysopsis Mariana* (L.) Nutt. Is a silky-hairy low plant, about a foot high, with oblong leaves and flat-topped clusters of flowers with bright yellow rays and disks. It is frequent in dry or sterile grass lands in southeastern Ohio. A second species also occurs.

341 Tall Goldenrod (P) *Solidago Canadensis* L. While there are many species of goldenrod (Solidago) more or less abundant along streams and the borders of woods, there seem to be two species only, requiring mention here as weeds; these are the tall goldenrod and the next or low goldenrod.

This one is tall and stout, three to five feet high, with rough, hairy stem, an abundance of lance-shaped, pointed, saw-toothed leaves and small heads of yellow flowers. The stem is very leafy, the leaves commonly five to six inches long. The plant comes frequently on wood borders and in fence-rows where, though pretty, it calls for destruction. Best killed out by cultivation or by digging.

342 Low Goldenrod (P) *Solidago nemoralis* Ait. It is by far the commonest goldenrod of sterile fields and dry roadsides. It grows from six inches to two feet high, having a grayish, hoary down and leaves wider toward the point, tapering toward the stem. The most characteristic part is the dense, one-sided cluster of bright yellow heads, beginning to open early in August. Like cinquefoil, the low goldenrod indicates a sterile soil, which calls for fertilizing and general improvement. The goldenrods are attacked by similar rusts and by the same mildews as those found upon ironweeds.

343 Heart-leaved Aster (P) *Aster cordifolius* L. Is a handsome aster, with broad, heart-shaped leaves, growing freely in fields and by roadsides, often accompanied by two or three other species of similar habits. It has a much branched stem, pale blue or nearly white rays, and pink to yellow disk flowers. Where too aggressive these asters may be killed out by cultivation, but they usually indicate a need of greater fertility.

344 Steelweed, Hairy Aster (P) *Aster ericoides pilosus* (Willd.) Porter. Within a few years a great deal of complaint of his weed has reached us from the region bordering tn the Ohio river, and in some localities, notably in Brown county, the idea has been advanced that ohe weed was brought in by the great flood of 1884. Examination, however, showed that the weed prevails throughout southeastern Ohio and has done so since the settlement by the whites. Mr. Nelson Cox, of Ensee, Lawrence county, informed me in 1894-5 that to his knowledge fields in his vicinity were badly infested with this weed about thirty years ago (1875-7).

Fig. 67. Steelweed.

Southern Ohio seems most congenial for this plant, although it is found as far north as Lake Erie. The weed is native, undoubtedly, over large portions of the state. It is a hairy, moderate sized plant, 1 to 3 feet high, with tapering leaves as shown in the cut (Fig. 67), short, white rays and purplish disk flowers. The favorite habitat of this weed is in dry, somewhat sandy land, where it proves decidedly aggressive. The dense, woody

stems are objectionable in meadows and the plant appears to be useless as forage. The characterization as a worst weed is well shown by a study of its habits in the hilly counties.

Seeds grayish, oblong, with roundish ends, 1-32 inch long, hair soft and weak, in a small ring, (Fig. 58 *a* and *b*). Carried freely by the wind. It is hopeless to undertake to eradicate hairy aster from the regions well suited to it. Like the goldenrod just mentioned, it is more or less indicative of sterile soil. Its habit shows that we may hope to subdue it by the husbandry practiced and by culitvation and fertilizing, thus in the end crowding it out with clover and grasses. Sheep will keep it down quite satisfactorily and are the usual solution of the problem in pastures.

345 Smooth Aster (P) *Aster lævis* L. This is a low-growing, smooth aster, with rather dark green leaves and sky-blue rays. It is common in dry situations and like the last more or less symptomatic.

346 Whitetop, Whiteweed, Daisy-fleabane (A) *Erigeron annuus* Pers. Is a common weed, 3 to 5 feet high, in meadows and other grass lands. It has a hairy stem and egg-shaped, coarsely and sharply toothed leaves. The rays are white, the disk yellow with the general appearance of a "daisy." The farmer knows its character but too well. Its appearance in meadows seems to be intermittent. This has already been mentioned on an earlier page. During 1895 and '96 there was very little whitetop in the clover fields here or elsewhere, but in 1897 it was very abundant. The explanation lies in the germination of the, buried seeds during the favorable rainy season of 1896, hence we may expect it again in 1898. The small plants might have been seen in the fall of 1896, with their dark green, coarsely toothed leaves, waiting only until spring should come, to send up their stems and produce flowers and seed. It will thus be seen that whitetop is a winter annual, and that we may expect crops of it so long as we produce crops of seed. This weed has become naturalized in Europe.

Seeds very small, light colored, with short tufts of tawny hairs (pappus). It certainly should be possible to remove these seeds wholly from grasses and clover by thorough cleaning, although this is by no means always accomplished.

Eradication of the whitetop has been outlined above. It must depend upon seed destruction. When the seeds are harvested with the hay and again scattered with the manure we can not expect to be rid of it. Where clover fields are badly infested this may be known by fall examination, and the ground again plowed for wheat, turning under the weeds.

347 Common Fleabane (P) *Erigeron Philadelphicus* L. Is like the preceding but growing in moist land only, and having rose-purple or flesh-colored rays. It is disposed of by drainage an cultivation.

348 Horseweed (A) *Leptilon Canadense* (L.) Britt. Horseweed is a tall, hairy plant, 1 to 5 feet high, with very narrow leaves scattered along the stem. It has dull flowers followed by an abundance of seed resembling that of whitetop. The leafy character has led to the local name of "mare's tail." This conspicuous weed may be killed, in uncultivated fields, by pulling it up, since the stem is always strong and the root not large.

349, 350 Plantain-everlasting (P) *Antennaria plantaginifolia* (L.) Richards, and *A. neglecta* Greene. This everlasting is a low plant, 4 to 12 inches high, with silky-woolly, plantain-like, whitish leaves in rather compact rosettes. It spreads by offsets and runners, thus extending rapidly under favorable conditions. It has a few globular heads of creamy flowers on upright stems a few inches in length. Seeds are produced in great abundance, though perhaps counting for much less than the runners in spreading the plant. This weed is found in dry, sterile soil and is apparently much more abundant in those of hard clay, being a conspicuous invader of these soils in the northeastern counties.

Like several of the foregoing it appears to indicate a soil out of condition. Such lands seem to need drainage and fertilizing and especially cultivation and rotation with clover. Where the weed comes in pastures the same method is required. A mixture of grasses will sometimes resist adverse conditions more successfully than a single kind.

351 Everlasting, Cudweed (A) *Gnaphalium obtusifolium* L. With its light color and woolly, fragrant foliage, the common everlasting may easily be known. It is 1 to 3 feet high, having white, clustered heads and lance-shaped leaves, tapering at the base. It is common in old fields and in dry woods. The cudweeds are none of them particularly aggressive, while the tall ones are far from handsome. This one may soon be destroyed by pulling or frequent mowing.

352 Low Cudweed (A) *Gnaphalium uliginosum* L. In contrast with the preceding, low cudweed is commonly 3 to 5 inches high, spreading upon the ground by diffuse branching. The heads are small, in dense terminal clusters, he foliage green above and whitish beneath. The small tufts of this weed are. common in dry soil. About Wooster they occur in gravel walks, fields and in open woodlands. Not especially prominent nor disfiguring. It has been proposed by a correspondent to use this as a bedding plant to secure marked tcontrast with alternanthera, in borders, etc. It may have value for this purpose

FIG. 68. Elecampane. (*After Millspaugh.*)

353 Elecampane (P) **Inula Helenium* L. Fig. 68 shows the appearance of a flowerstalk and flower of this plant. It is stout, 3 to 5 feet high, with very large lower leaves, woolly beneath. Elecampane has a thick root, and the leaves springing from it have long petioles while the stem leaves are partly clasping. This weed has been occasionally transplanted, probably for ornament or reputed medicinal qualities. It is found in fields, about old house-sites and by roadsides. As a weed, it shows good powers of resistance and capacity to spread. The plant belongs among our weeds.

Seeds brown, four to five ribbed, 1-6 inch long with pappus (hairs). They are blown by the wind. The thick, fleshy root of this weed is not easy to kill. Close cutting with the hoe, if repeated, will soon conquer the plant.

354 Cup-plant, Rosinweed (P) *Silphium perfoliatum* L. This plant has large, square stems and ample leaves uniting by their bases to form the 'cups'. The heads are rather few, large with yellow rays. Frequent along roadways especially in moist soil. Destroyed by hoe cutting.

355 Ox-eye (P) *Heliopsis helianthoides* (L.) B. S. P. Ox-eye is a smooth plant, with opposite, three-ribbed, toothed leaves and yellow heads resembling those of the sunflowers, from which the glabrous aspect of the plant serves to distinguish the ox-eye. Frequent along roadsides and borders.

356 Yellow Daisy, Brown-eyed Susan, Niggerhead (B) *Rudbeckia hirta* L. The yellow daisy, with its rough, bristly stems, 1 to 2 feet high, oblong or tapering leaves, and large heads with yellow rays and dark purple disk flowers, is found generally in meadows and by roadsides. Seeds brown, four-angled, about 3-16 inch long, with no pappus (hairs) and only a minute border at the top. Frequent in grass and clover seeds. This biennial, if not continuously introduced in the seeds sown, may soon be killed out by hand digging.

357 Sunflowers (P) *Helianthus* spp. The wild sunflowers with their broad leaves and tall stems surmounted by beautiful yellow flower-heads, are usually conspicuous in rich bottoms and upon dry hillsides. The seeds unlike the most of the family, are without hairy plums. Sunflowers may be destroyed by cultivation or by free use of the hoe and salt.

358 Winged-ironweed, Yellow Ironweed (P) *Verbesina alternifolia* (L.) Britt. It is a frequent pest in bottoms. It is very similar in habit to the ironweeds, differing in the yellow heads of flowers and in the winged stems; the wings are more prominent above. It grows 4 to 8 feet high, persisting by the perennial roots. To be treated in the same manner as the other ironweeds.

359 Spanish Needles (A) *Bidens bipinnata* L. A low, smooth, much branched annual, with three times parted, egg-shaped tapering leaves and inconspicuous, yellow flowers, which is commonly found growing in moderately dry pastures and waste places. Because of it the sheep come up with brown head-gear at the time when nuts begin to drop and squirrels are plenty in the woods.

Seeds dark, four sided, needle-shaped, 5-8 inch long, tipped with two to four stout, downwardly barbed awns. Gathered freely by the wool of sheep. Successfuly removed by hand pulling and mowing before the seeds are formed.

360-361 Stick-tights, Beggar's-ticks (A) *Bidens connata* Muhl., *Bidens frondosa* L. These are taller, leafy annuals, more frequent than the last, especially in moist lands. Seeds brown, flat, thin, with two or more bearded, forked awns at the top, adhering freely to clothing and animals. May be subdued largely by a free use of the scythe in late summer.

362 Tickseed Sunflower (A) *Bidens trichosperma* (Michx.) Britt. This is a smooth, branched, rather tall growing plant, with 3 to 7-divided leaves and rather large heads of flowers having golden-yellow rays; seeds much as the last. It is commonly found in wet or marshy land, but as reported from Mahoning county by Mr. E. W. Vickers, this plant is capable of growing along dry roadsides. In these situations near Ellsworth, it grew luxuriantly, proving obnoxious to the judgment if not to the eye. For its destruction the same measures are recommended as for stick-tights.

363 Galinsoga (A) **Galinsoga parviflora* Cav. Galinsoga has become widely distributed over Ohio, having been introduced from tropical America. It is a low, branching annual, with nettle-like leaves and minute heads with whitish rays. Very frequent in waste places. Destroyed by prevention of seeding. Seeds dark, pyramidal, four-sided and ribbed, 1-16 inch long, narrow below.

364 Sneezeweed (P) *Helenium autumnale* L. Is a rather smooth plant, 2 to 4 feet high, with toothed, lance-shaped leaves and handsome heads of yellow flowers. The yellow rays are 3 to 5-parted at the tip, which character may serve to identify it. Quite frequent along banks of streams and ditches. Not especially noxious but sometimes impeding the discharge of overflowing waters. Western species of sneezeweed have been introduced in grass seeds.

365 Fetid Marigold (A) **Boebera papposa* (Vent.) Rydb. It is a nearly smooth plant, about a foot high, with leaves resembling those of spanish needles but prickly toothed. It has a disagreeable odor and has recently become transplanted from the west. It grows luxuriantly where established.

Seeds dark, slender, four-angled, about 1-6 inch long, wider above, covered with upwardly pointing hairs, crowned by a ring of short, rusty-brown pappus. Becoming frequent in western seeds and hay. Destroy it in the same manner as the other annuals just described. It is well worth while to scrutinize the seeds used in order to avoid planting this weed. Its character in Ohio is yet to be learned, though rating nearly as mayweed.

366 Yarrow, Milfoil (P) *Achillea Millefolium* L. Fig. 69 will give an idea of the appearance of this pest of the grass lands. It commonly grows 2 to 4 feet in height and has many fern-like, much divided leaves and flat clusters of flowers having white or pink rays. It is very frequent in lawns and by roadsides. An unsightly, ill-smelling plant, much too common.

Fig. 69. Yarrow. (*After Millspaugh.*)

Seeds small, gray, somewhat wedge-shaped, about 1-12 inch long. Frequent in seeds of timothy and clover in which they constitute a very damaging impurity. Any seeds of yarrow should cause the rejection of the seeds. Destroyed by cultivation or by persistent hand digging. At some points provision might be made for the cultivation of unused roadsides to rid them of this and other weeds.

367 Mayweed, Dog's Fennel (A) **Anthemis Cotula* L. An acrid, ill-smelling annual, shown in Fig. 70. This has leaves cut into narrow segments and small heads of flowers with yellow centers and white rays. A vile weed introduced from Europe, abundant in waste places. The stock-runs and yards are the favorite places for mayweeds. About them it flourishes, usually, without hindrance.

Fig. 70. Mayweed. (*After Millspaugh.*)

Seeds somewhat columnar, tapering to the base, 1-16 inch long with from eight to ten rows of warty projections extending lengthwise. Frequent in the seeds of clover and grasses. It should be cut or pulled up and destroyed before the blossoms open. If the weed is persistently mown, it will soon be reduced in numbers. The mowing machine here, as with ragweed, can be made serviceable.

368 Corn-camomile (A or B) **Anthemis arvensis* L. This weed resembles mayweed but is not ill-scented. It is capable of proving a much worse pest upon the farm because it invades wheat fields and meadows to their great detriment. It is beginning to be found at various points and should be guarded against in the purchase of seeds.

Its seeds resmble the preceding, but with a minute, scale border at the summit. Impurity of seed is the source of danger and seed scrutiny the means of prevention. It is worth while to pull this out of meadows, etc., by hand or to replow a new one that is badly seeded with the weed.

369 Oxeye Daisy, White Daisy (P) **Chrysanthemum Leucanthemum* L. The illustration, Fig. 71, will serve to show the characters of this vile weed. Its pretty heads of flowers with white rays and yellow centers are larger than those of any similar weed, while the cut-toothed, narrow leaves complete the essential characters. An introduced weed that has

Fig. 71. Oxeye Daisy. (*After Vasey.*)

rightly been outlawed in most state weed laws. It is nearly always spread by the seeds, which are carried in hay and in seeds of various sorts. Large portions of Ohio are comparatively free from oxeye daisy, while it is found to be a bad pest in many counties. Perennial by short, rather thick rootstocks, it must be entirely uprooted before it will perish.

Seeds gray to black as viewed, broader above, with many light colored ribs lengthwise, 1-12 inch long, no pappus and with a sharp point. Frequent in grass seeds, wherein it is an impurity forbidden by statute. Oxeye daisy, like narrow plantain, requires careful cultivation to destroy it. Where but few plants are found these may be removed by hand digging, but no badly infested field should be continued in grass without first cultivating the weeds out of existence. With this, as with several other weeds, the whole community is concerned when one resident permits it to grow and fails to make sufficient effort to destroy it.

370 Costmary (P) **Chrysanthemun Balsamita* L. This plant, locally called lavender (erroneously), often with rayless yellow heads, is a frequent weed about old gardens. The scented leaves are recalled by most persons. Requires grubbing

371 Feverfew (P) **Chrysanthemum Parthenium* (L.) Pers, Is a third weedy species of the genus. This has rather pretty heads of small size.

372 Tansy (P) **Tanacetum vulgare* L. Tansy is often planted and remains unless carefully destroyed. It has yellow heads of flowers in dense, flat-topped, clusters, and much dissected leaves. It is a bitter, acrid and showy, ill-smelling herb. Seeds angled and ribbed, 1-10 inch long with a large, flat top and a short crown. Plants destroyed by cultivation or by grubbing.

373 Wormwood (B) *Artemisia biennis* L. This weed grows from 2 to 3 feet high, and has divided, narrowly lobed leaves and inconspicuous heads. The plant has a penetrating, though not entirely unpleasant odor and a bitter taste. It grows with an erect habit and a leafy stem. It has been introduced into a large number of southeastern counties as well as about cities. Seeds small, slender, 1-20 inch long. Destroyed by pulling or grubbing.

374 Mugwort (P) **Artemisia vulgaris* L. Mugwort resembles the preceding but has smaller heads and perennial roots. It is the more objectionable.

375 Fireweed (A) *Erechthites hieracifolia* Raf. This plant is a tall, rank-smelling weed with grooved stem and thin, cut-toothed, tapering leaves. The flowers are whitish, succeeded by an abundance of seeds having a large tuft of hairs on each. This is the weed of new clearings and logheaps. It is attacked by two leaf mildews, *Erysiphe communis* (Wallr.) Schw. and *Sphærotheca Castagnei* Lév. and also by *Septoria Erechthites* Ell & Ev. Being an annual it is easily destroyed by cutting, pulling or digging before the blossoms open.

376 Common Groundsel (A) **Senecio vulgaris* L. This is a hollow-stemmed plant, a foot or more high, with incised, oblong leaves and many rayless heads. Now infrequent but destined to become an unsightly and common pest in cultivated ground and waste places.

377 Burdock (B) **Arctium Lappa* L. With its very large, rounded leaves and tall stems, having small heads of purplish flowers, the burdock is scarcely unknown. The heads become armed with hooked tips, making them like the burs of Xanthium in adhesiveness. They prove vile pests in the wool of sheep and in the manes of horses. The plant has very large, deep roots.

Seeds light brown, spotted with darker, wider above, 1-12 inch long, with occasional lines lengthwise and a short, bristly pappus; occasionally found in seeds. Burdocks may be removed with mattock if done before flowering. Certainly if conspicuousness of a plant leads to its recognition there is no reason why burdock should be so often seen about fields and roadsides.

378 Canada Thistle, Field Thistle (P) ***Carduus arvensis L.** This field pest is well enough known by name, yet a good many persons are mistaking it for other plants and calling other plants the thistle. A complete illustration is shown in Fig. 72. The essential differences from other thistles are the underground stems (with numerous shoots coming to the surface as shown in the figure) the lobed and very spiny leaves and the smaller heads. The absence of the thick tap-root alone usually makes us certain that we have to do with the so-called Canada thistle. It is incorrectly so-named, because it is introduced from Europe and not from Canada. The specific name "*arvensis*" means growing in fields, hence field thistle is a much more correct name. Perhaps there is no weed name that carries with its utterance more of dread to the landowner than that of Canada thistle, yet as I have endeavored to make clear in previous pages, its most noxious feature, that of creeping, rooting, underground stems, is possessed by a dozen or more others, including horse-nettle, toad-flax, milkweed, ground-ivy, cypress-spurge, nut-grass, periwinkle, bracted bindweed, field bindweed, quack-grass, dogbane and elders. While this is a vile weed it has been over advertised in comparison with some others equally as bad. It has been asserted that the Canada thistle does not mature seeds in any part of Ohio. Though it may not ripen seeds south of the latitude of Columbus, it certainly appears to form viable seeds in this county and to the northward. It springs from seed in many new places each year, and spreads from the underground growth in the others. Its capabilities of forming new plants underground are shown in the four shoots of Fig. 72. Open woodlots are its favorite place to grow from seed. The farmer may rightly be particular in looking such carefully through each year. When a tract of these weeds has been discovered the next point is to destroy them before they spread to a great distance. Railroad rights-of-way and roadsides often become infested and in these, plants have not always received the attention required to kill them out. It is attacked by a rust, *Puccinia suaveolens* Rostr., which it has been proposed to use to destroy it. The fungus can scarcely be expected to accomplish this end.

Fig. 72. Canada Thistle. *The lower figure shows how new plants arise from rootstocks.*

Seeds gray, oblong, 1-8 inch long, striate with obscure lines and with a copious pappus by which they may be carried many miles; present in hay and seeds. In the latter, if known, their presence is a punishable offense. (Sec. 7001 Revised Statutes of Ohio). The eradication of Canada thistles is required by their character, but no one can hope to reach this end without continued effort. Sure and swift cures or destroyers may be advertised, yet the nature of the plant including character of growth, makes these claims beyond reasonable expectations. I have often heard it claimed that Canada thistle had been killed by a single treatment, and while this is possible it is very seldom attained. The underground stems must be starved out to kill Canada thistle. This starving is a slow process and we must be content in our measures, to let time operate. Destruction of this weed falls under two plans:

1. Destruction in small patches.
2. Destruction in field areas of an acre or more.

For the first, repeated cutting with hoe and applications of salt, kerosene (coal oil) or sulfuric acid to the cut stems in the ground will usually prove the cheapest and best method. The treatment, at least the cutting, needs to be repeated as often as green leaves of the thistle show above ground. Cutting alone will be sufficient to destroy them but it will need to be followed for two or more seasons to be effectual.

In areas too large to be destroyed by hand work, the summer fallow may be used, to be followed by hand treatment to kill out the small remaining areas. The field should be plowed shallow in June and harrowed to destroy all green tops. Upon the appearance of new growth of the thistles it should be cross-plowed and again harrowed. This procedure is repeated thorughout the season, to be followed by carefu' tillage the next year in corn, potatoes or some other crop that is to receive all-summer hoeing and cleaning. After this some patches will commonly remain to be killed out as first suggested. Refuse packing or house salt, which is quoted at about twenty-five cents per barrel, is perhaps the cheapest chemical to apply after cutting. Kerosene is sometimes recommended, yet costs more, while sulfuric acid is dangerous to handle, although effective in burning up and destroying whatever it may be applied to.

Smothering with straw is rarely successful, since the thistles finally grow through it, aside from its depriving the owner of the use of the land for a longer time than summer fallow. The correct principle of destruction is, however, of more importance than the mere method. This is to starve out the underground stems. Two or more seasons will be needed.

379 Common Thistle, Bull Thistle (B) **Carduus lanceolatus* L. The common, purple-flowered thistle found in pastures is a biennial, 2 to 4 feet high, with deep tap-root. The plants start in the fall and may be seen during winter waiting for the next summer to blossom and fruit. The cut (Fig. 73), shows the appearance of the head of this weed; these are about one inch across.

FIG. 73. Common Thistle. (*After Millspaugh.*)

Seeds gray, larger than those of the Canada thistle, 1-4 inch long and abundantly supplied with pappus. Common in hay and seeds. Destroyed by cutting off below crown before blossoming, usually not destroyed by mowing.

380 Tall Thistle (B) *Carduus altissimus* L. Is a native thistle with downy stems, 3 to 10 feet high, leafy to the heads and leaves white woolly underneath. The flowers are chiefly purple, the heads large, 1 1-2 to 2 inches high. It is found in damp thickets and fields. Destroyed as the preceding. Seeds dark brown, 3-16 inch long and smooth.

381 Swamp Thistle *Carduus muticus* (Michx.) Pers. Is another thistle found in swamps; it has the leaves green on both sides and the heads almost without prickles. It is usually not aggressive.

382 Cotton or Scotch Thistle (B) **Onopordon Acanthium* L. This is an abundant weed in the vicinity of Cincinnati. It has a cottony appearance all over and the leaves extending as wings down the stem. Destroyed in the same manner as the common thistle.

383 Blue-bottle, Corn Thistle (A) **Centaurea Cyanus* L. Is the escaped bachelor's button which sometimes is quite showy in grain fields. It may be removed by hand. Other annual species also are found.

Seeds bluish-white, oblong, 1-8 inch long with brown, "paint brush" circle of pappus half or more than half as long as the seed body. Conspicuous by reason of this "brush."

384 Brown Knapweed (**P**) ******Centaurea Jacea* **L.** This is a perennial plant of the genus, whose seeds are frequent in alfalfa seed. These seeds are light colored and shining but without brush of pappus.

385 Star Thistle (**A**) ******Centaurea solstitialis* L. This star thistle is a conspicuous plant with an array of long, straw-colored spines about the yellow head, after the manner of true thistles. The stems are wing-angled, woolly, 1 to 2 feet high, with leaves very narrow or of narrow segments. The whole is grayish in color. Eradicated by uprooting. Seeds usually light-colored, smooth and shining, 1-10 inch long, with a light pappus longer than the seed; occasionally there are dark seeds of mottled aspect without pappus "brush" in the same head. Present in alfalfa seed as attested by numerous specimens received from alfalfa seedings in Ohio.

FOREIGN SEEDS FOUND IN COMMERCIAL SEED SAMPLES

The following named species of weed or foreign seeds have been found in commercial samples of seeds examined during the past few years. All the seed samples were either purchased for use in Ohio or offered for sale in the state.

FOUND IN RED AND MAMMOTH CLOVER SEEDS.

Grass Family.

Barnyard-grass, *Echinochloa Crus-galli* (L.) Beauv.
Blue-grass, Kentucky, *Poa pratensis* L.
" " Flat-stemmed, *Poa compressa* L.
Crab-grass, *Syntherisma sanguinalis* (L.) Nash.
" " " *filiformis* (L.) Nash.
" " " *linearis* (Krock) Nash.
Foxtail, Yellow, *Chætochloa glauca* (L.) Scribn.
" Green, *Chætochloa viridis* (L.) Scribn.
" Whorled, *Chætochloa verticillata* (L.) Scribn.
Italian Millet, *Chætochloa Italica* (L.) Scribn.
Millet, *Panicum miliaceum* L.
Old Witch-grass, *Panicum capillare* L.
Quack-grass, *Agropyron repens* (L.) Beauv.
Slender Paspalum, *Paspalum setaceum* Michx.
Timothy, *Phleum pratense* L.

Sedge Family.

Sedges, *Carex* spp.

Buckwheat Family.

Black Bindweed, *Polygonum Convolvulus* L.
Dock, Broad, *Rumex obtusifolius* L.
" Curled, " *crispus* L.
" Pale, " *salicifolius* Weinm.
" Tall, " *altissimus* Wood.
Sorrel, *Rumex Acetosella* L.
Knotweed, *Polygonum aviculare* L.
" Erect, *Polygonum erectum* L.
Lady's Thumb, " *Persicaria* L.
Penna. Smartweed, " *Pennsylvanicum* L.
Tear-thumb, *Polygonum sagittatum* L.

Goosefoot Family.

Lamb's-quarters, *Chenopodium album* L.
Mexican Tea, " *ambrosioides* L.
Spreading Orache, *Atriplex patula* L.
Western Orache, *Atriplex truncata* (Torr.) A. Gray.

Amaranth Family.

Slender Pigweed, *Amaranthus hybridus* L.
Rough Pigweed, *Amaranthus retroflexus* L.
Spreading Pigweed, *Amaranthus blitoides* Wats.
Tumbleweed, *Amaranthus graecizans* L.

Pink Family.

Forked Catchfly, *Silene dichotoma* L.
Night-flowering Catchfly, *Silene noctiflora* L.
Stitchwort, *Alsine longifolia* (Muhl.) Britton.
Chickweed, " *media* L.

Mustard Family.

Black Mustard, *Brassica nigra* (L.) Koch.
Charlock, Wild Mustard, *Brassica arvensis* (L.) B. S. P.
Turnip, *Brassica campestris* L.
Field Peppergrass, *Lepidium campestre* L.
Peppergrass, *Lepidium Virginicum* L.
Shepherd's-purse, *Bursa Bursa-pastoris* (L.) Britt

Rose Family.

Rose, *Rosa humilis* Marsh.
Tall Fivefinger, *Potentilla Monspeliensis* L.

FOUND IN ALFALFA SEED.

Grass Family.

Barnyard-grass, *Echinochloa Crus-galli* (L.) Beauv.
Crab-grass, *Syntherisma sanguinalis* (L.) Nash.
Fescue-grass, *Festuca ovina* L.
Foxtail, Green, *Chætochloa viridis* (L.) Scribn.
" Yellow, " *glauca* (L.) Scribn.
" Whorled, " *verticillata* (L.) Scribn.
Kentucky Blue-grass, *Poa pratensis* L.
Millet, *Panicum miliaceum* L.
Old Witch-grass, *Panicum capillare* L.
Quack-grass, *Agropyron repens* (L.) Beauv.
Reed Canary-grass, *Phalaris arundinacea* L.
Timothy, *Phleum pratense* L.

Sedge Family.

Sedges, *Carex* spp.

Buckwheat Family.

Black Bindweed, *Polygonum Convolvulus* L.
Dock, Broad, *Rumex obtusifolius* L.
" Curled, " *crispus* L.
Sorrel, *Rumex Acetosella* L.
Knotweed, *Polygonum aviculare* L.
Water Pepper, *Polygonum Hydropiper* L.
Lady's Thumb, *Polygonum Persicaria* L.

Goosefoot Family.

Cycloloma, *Cycloloma atriplicifolium* (Spreng.) Coult.
Goosefoot, *Chenopodium murale* L.
Lamb's-quarters, *Chenopodium album* L.
Russian Thistle, *Salsola Tragus* L.
Western Orache, *Atriplex truncata* (Torr) A. Gray

Amaranth Family.

Spreading Pigweed, *Amaranthus blitoides* Wats.
Rough Pigweed, *Amaranthus retroflexus* L.
Tumbleweed, *Amaranthus graecizans* L.

Pink Family.

Forked Catchfly, *Silene dichotoma* L.
Night-flowering Catchfly, *Silene noctiflora* L.
Cowherb, *Vaccaria Vaccaria* (L.) Britt

Mustard Family

Black Mustard, *Brassica nigra* (L.) Koch.
Charlock, *Brassica arvensis* (L.) B. S. P.
False Flax, *Camelina sativa* (L.) Cranz.
Hare's-ear Mustard, *Conringia orientalis* L.
Peppergrass, *Lepidium Virginicum* L.
Rape, *Brassica Napus* L.
Turnip, *Brassica campestris* L.

Pea Family.

Alsike Clover, *Trifolium hybridum* L.
Black Medick, Yellow Trefoil, *Medicago lupulina* L.
Bird's-foot Trefoil, *Lotus corniculatus* L.
White Sweet Clover, *Melilotus alba* L.
Yellow Sweet Clover, *Melilotus officinalis* L.
Coronilla, *Coronilla scorpioides* L.
Red Clover, *Trifolium pratense* L.
White Clover, *Trifolium repens.* L.

Spurge Family.

Prickly Poppy, *Argemone alba* Lestib.
Three-seeded Mercury, *Acalypha Virginica* L.

IN CLOVER—(Continued).

Pea Family.

Alsike Clover, *Trifolium hybridum* L.
White Clover, *Trifolium repens* L.
Coronilla, *Coronilla scorpioides* L.
Bird's-foot Trefoil, *Lotus corniculatus* L.

Woodsorrel Family.

Yellow Woodsorrel, *Oxalis stricta* L.

Spurge Family.

Spurge, *Euphorbia nutans* Lag.
Three-seeded Mercury, *Acalypha Virginica* L.

Mallow Family.

Low Mallow, *Malva rotundifolia* L.

Carrot Family.

Wild Carrot, *Daucus Carota* L.
Pimpernel, *Pimpinella Saxifraga* L.

Dodder Family.

Clover Dodder, *Cuscuta Epithymum* Murr.
Field Dodder, " *arvensis* Beyr.

Vervain Family.

White Vervain, *Verbena urticifolia* L.

Mint Family.

Pennyroyal, *Hedeoma pulegioides* L.
Self-heal, *Prunella vulgaris* L.
Catnip, *Nepeta Cataria* L.

Potato Family.

Climbing Bittersweet, *Solanum Dulcamara* L.
Black Nightshade, *Solanum nigrum* L.
Horse Nettle, *Solanum Carolinense* L.

Figwort Family.

Moth-mullen, *Verbascum Blattaria* L.

Plantain Family.

Bracted Plantain, *Plantago aristata* Michx.
Broad, " " *major* L.
Narrow " " *lanceolata* L.
Rugel's Broad Plantain, *Plantago Rugelii* Decaisne.

Madder Family.

Blue Field-madder, *Sherardia arvensis* L.

Chicory Family.

Chicory, *Cichorium Intybus* L.
Dandelion, *Taraxacum Taraxacum* (L.) Karst.
Prickly Lettuce, *Lactuca virosa* L.
Worm Salad, *Picris echioides* L.

Ragweed Family.

Ragweed, *Ambrosia artemisiæfolia* L.
Great Ragweed, *Ambrosia trifida* L.
Marsh Elder, *Iva axillaris* Pursh.

Thistle Family.

Canada Thistle, *Carduus arvensis* L.
Common Thistle, " *lanceolatus* L.
Fireweed, *Erechthites hieracifolia* L.
Mayweed, *Anthemis Cotula* L.
Oxeye Daisy, *Chrysanthemum Leucanthemum* L.
Scentless Camomile, *Matricaria inodora* L.
Star Thistle, *Centaurea solstitialis* L.
Yarrow, Milfoil, *Achillea millefolium* L.

IN ALFALFA—(Continued).

Mallow Family.

False Mallow, *Malvastrum coccineum* (Pursh. Gray.
Low Mallow, *Malva rotundifolia* L.
Musk Mallow, *Malva moschata* L.
Sida, *Sida spinosa* L.

Carrot Family.

Caraway, *Carum Carui* L.
Wild Carrot, *Daucus Carota* L.
Pimpernel, *Pimpinella Saxifraga* L.

Dodder Family.

Clover Dodder, *Cuscuta Epithymum* Murr.
Field Dodder, *Cuscuta arvensis* Beyr.

Borage Family.

Amsinckia, *Amsinckia intermedia* F. & M.
Amsinckia, *Amsinckia tessellata* Gray.

Vervain Family.

White Vervain, *Verbena urticifolia* L.

Mint Family.

Sage, *Salvia lyrata* L.
Self-heal, *Prunella vulgaris* L.

Potato Family.

Climbing Bittersweet, *Solanum Dulcamara* L.

Plantain Family.

Bracted Plantain, *Plantago aristata* Michx.
Broad Plantain, *Plantago major* L.
Narrow Plantain, *Plantago lanceolata* L.
Rugel's Broad Plantain, *Plantago Rugelii* Dec.

Chicory Family.

Chicory, *Cichorium Intybus* L.
Worm Salad, *Picris echioides* L.
Fall Dandelion, *Leontodon autumnale* L.

Ragweed Family.

Ragweed, *Ambrosia aptera* L.
Ragweed, *Ambrosia artemisiæfolia* L.
Marsh Elder, *Iva ciliata* Willd.
Marsh Elder, *Iva axillaris* Pursh.
Marsh Elder, *Iva xanthiifolia* (Fresen) Nutt.

Thistle Family.

Brown Knapweed, *Centaurea jacea* L.
Canada Thistle, *Carduus arvensis* L.
Common Thistle, *Carduus lanceolatus* L.
Gum-plant, *Grindelia squarrosa* (Pursh) Dunal.
Mayweed, *Anthemis Cotula* L.
Yellow Camomile, *Anthemis tinctoria* L.
Oxeye Daisy, *Chrysanthemum Leucanthemum* L.
Scentless Camomile, *Matricaria inodora* L.
Star Thistle, *Centaurea solstitialis* L.
Sunflower, *Helianthus ciliaris* L.

FOUND IN ALSIKE CLOVER.

Grass Family.

Crab-grass, *Syntherisma sanguinalis* (L.) Nash.
Foxtail, Yellow, *Chaetochloa glauca* (L.) Scribn.
" Green, " *viridis* (L.) Scribn.
Kentucky Blue-grass, *Poa pratensis* L.
Old Witch-grass, *Panicum capillare* L.
Redtop, *Agrostis alba* L.
Timothy, *Phleum pratense* L.

Buckwheat Family.

Dock, Broad, *Rumex obtusifolius* L.
Lady's Thumb, *Polygonum Persicaria* L.
Sorrel, *Rumex Acetosella* L.

Goosefoot Family.

Lamb's-quarters, *Chenopodium album* L.

Amaranth Family.

Tumbleweed, *Amaranthus graecizans* L.

Pink Family.

Night-flowering Catchfly, *Silene noctiflora* L.
Forked Catchfly, *Silene dichotoma* L.
Chickweed, *Alsine graminea* L.
" *Cerastium* sp.
Common Chickweed, *Alsine media* L.
Spurry, *Spergula arvensis* L.

Mustard Family.

Charlock, *Brassica arvensis* (L.) B. S. P.
False Flax, *Camelina sativa* L.
Peppergrass, *Lepidium Virginicum* L.
Shepherd's-purse, *Bursa Bursa-pastoris* (L.)

Rose Family.

Tall Fivefinger, *Potentilla Monspeliensis* L.

Pea Family.

Alfalfa, *Medicago sativa* L.
Black Medick, *Medicago lupulina* L.
Red Clover, *Trifolium pratense* L.
White Clover, " *repens* L.

Spurge Family.

Three-seeded Mercury, *Acalypha Virginica* L

Dodder Family.

Clover Dodder, *Cuscuta Epithymum* Murr.

Mint Family.

Selfheal, *Prunella vulgaris* L.

Figwort Family.

Eyebright, *Euphrasia officinalis* L.

Plantain Family.

Bracted Plantain, *Plantago aristata* Michx.
Broad " " *major* L.
Narrow Plantain, *Plantago lanceolata* L.
Rugel's Broad Plantain, *Plantago Rugelii* Dec

Chicory Family.

Chicory, *Cichorium Intybus* L.
Nipplewort, *Lapsana communis* L.

Thistle Family.

Canada Thistle, *Carduus arvensis* L.
Field Camomile, *Anthemis arvensis* L.
Gum-plant, *Grindelia squarrosa* (Pursh.)
Marsh Elder, *Iva xanthiifolia*. (Fresen.)
Mayweed, *Anthemis Cotula* L.
Oxeye Daisy, *Crysanthemum Leucanthemum* L.
Pyrethrum *Pyrethrum inodorum* L.

FOUND IN TIMOTHY SEED.

Foxtail-grass, *Chætochloa viridis* (L.) Scribn.
Kentucky Blue-grass, *Poa pratensis* L.
Old Witch-grass, *Panicum capillare* L.
Redtop, *Agrostis alba* L.
Sedge, *Carex* spp.
Bitter Dock, *Rumex obtusifolius* L.
Sorrel, *Rumex Acetosella* L.
Lamb's-quarters, *Chenopodium album* L.
Tumbleweed, *Amaranthus graecizans* L.
Peppergrass, *Lepidium Virginicum*.
Tall Fivefinger, *Potentilla Monspeliensis* L.
Alsike Clover, *Trifolium hybridum* L.
Alfalfa, *Medicago sativa* L.
White Clover, *Trifolium repens* L.
Red Clover, *Trifolium pratense* L.
Wild Carrot, *Daucus Carota* L.
Nettle, *Urtica dioica* L.
Bracted Vervain, *Verbena bracteosa* Michx.
White " " *urticifolia* L.
Moth-mullen, *Verbascum Blattaria* L.
Broad Plantain, *Plantago Rugelii* Dec.
NarrowPlantain, *Plantago lanceolata* L.

FOUND IN OATS.

2½ quarts out of 2 bushels contained.

Barnyard grass, *Echinochloa Crus-galli* (L.) Beauv.
Green Foxtail, *Chætochloa viridis* (L.) Scribn
Sprouting Crab-grass, *Panicum proliferum* L.
Timothy, *Phleum pratense* L.
Curled Dock, *Rumex Crispus* L.
Lady's Thumb, *Polygonum Persicaria* L.
Pennsylvania Smartweed, *Polygonum Pennsylvanicum* L.
Tear-thumb, *Polygonum sagittatum* L.
Wild Buckwheat, *Polygonum Convolvulus* L.
Nightflowering Catchfly, *Silene noctiflora* L
Black Mustard, *Brassica nigra* L.
Indian Mustard, *Brassica juncea* L.
Flax, *Linum usitatissimum* L.
Narrow Plantain, *Plantago lanceolata* L.
Yellow Daisy, *Rudbeckia hirta* L.
Oats, *Avena*.
Also hulled seeds of various Polygonums.

PLATE I.

Each magnified about 5 diameters.

No. 1 *Sorghum Halepense* (L) Pers.....Johnson-grass, 2 seeds.
2 *Syntherisma sanguinalis* (..) Du..s.....Crab-grass, 4 seeds.
3 *Syntherisma linearis* (Krock) Nash.....Small Crab-grass, 2 seeds.
4 *Panicum capillare* L.....Old Witch-grass, 4 seeds.
5 *Agropyron repens* (L) Beauv.....Quack-grass, 2 seeds.
6 *Poa compressa* L.....Wire-grass, 2 seeds.
7 *Poa annua* L.....May-grass, 2 seeds.
8 *Chaetochloa glauca* (L) Scribn.....Yellow Foxtail, 4 seeds.
9 *Chaetochloa viridis* (L) Scribn.....Green Foxtail, 4 seeds.
10 *Chaetochloa verticillata* (L) Scribn.....Whorled Foxtail, 2 seeds.
11 *Chaetochloa Italica* (L) Scribn.....Italian Millet, 2 seeds.
12 *Echinochloa Crus-galli* (L) Beauv.....Barnyard-grass, 4 seeds.
13 *Panicum miliaceum* L.....Millet, 2 seeds.
14 *Eleusine Indica* (L) Gaertn.....Dog's-tail Grass, 2 seeds.
15 *Phleum pratense* L.....Timothy, 4 seeds.
16 *Eragrostis major* Host.....Stinking-grass, 4 seeds.
17 *Phalaris arundinacea* L.....Reed Canary-grass, 2 seeds.
18 *Festuca elatior* L.....Meadow Fescue, 2 seeds.
19 *Bromus secalinus* L.....Chess, 2 seeds.
20 *Scirpus Americanus* Pers.....Club-rush, 2 seeds.
21 *Scirpus atrovirens* Muhl.....Dark-green Bulrush, 2 seeds.
22 *Carex lurida* Wahl.....Sallow Sedge, 2 seeds.
23 *Urtica gracilis* Ait.....Slender Nettle, 4 seeds.
24 *Polygonum aviculare* L.....Knot-grass, 4 seeds.
25 *Polygonum Persicaria* L.....Lady's-thumb, 4 seeds.
26 *Polygonum Pennsylvanicum* L.....Pennsylvania Smartweed, 4 seeds.
27 *Polygonum sagittatum* L.....Tear-thumb, 2 seeds.
28 *Polygonum hydropiperoides* Michx.....Mild Water Pepper, 2 seeds.
29 *Rumex altissimus* Wood.....Tall Dock, 4 seeds,
30 *Rumex salicifolius* Weinm.....Willow Dock, 2 seeds.

From original photographs by P. A. Hinman and J. M. Van Hook.

PLATE I

PLATE II.

Each magnified about 5 diameters.

No. 1 *Polygonum Convolvulus* L.....Black-bindweed, 4 seeds.
2 *Rumex Acetosella* L.....Sorrel, 4 seeds.
3 *Rumex crispus* L.....Curled Dock, 4 seeds.
4 *Rumex obtusifolius* L.....Bitter Dock, 4 seeds.
5 *Chenopodium album* L.....Lamb's-quarters, 4 seeds.
6 *Chenopodium ambrosioides* L.....Mexican Tea, 4 seeds.
7 *Salsola Tragus* L.....Russian Thistle, 4 seeds.
8 *Atriplex truncata* (Torr) A Gray.....Western Orache, 4 seeds.
9 *Cycloloma atriplicifolium* (Spreng) Coult....Winged Pigweed, 3 seeds—1 with covering.
10 *Amaranthus graecizans* L.....Tumbleweed, 4 seeds.
11 *Amaranthus blitoides* Wats.....Spreading Amaranth, 4 seeds.
12 *Silene conica* L.....Conical Catchfly, 4 seeds.
13 *Silene noctiflora* L.....Night-flowering Catchfly, 4 seeds.
14 *Silene dichotoma* Ehrh.....Forked Catchfly, 2 seeds.
15 *Alsine media* L.....Common Chickweed, 2 seeds.
16 *Cerastium longipedunculatum* Muhl.....Nodding Chickweed, 2 seeds.
17 *Scleranthus annuus* L.....Knawel, 2 seeds.
18 *Agrostemma Githago* L.....Cockle, 4 seeds.
19 *Dianthus Armeria* L.....Deptford Pink, 2 seeds.
20 *Saponaria officinalis* L.....Bouncing-bet, 2 seeds.
21 *Vaccaria Vaccaria* (L) Britt.....Cow-herb, 2 seeds.
22 *Spergula arvensis* L.....Spurry, 2 seeds.
23 *Ranunculus acris* L.....Buttercup, 2 seeds—1 with covering
24 *Papaver dubium* L.....Poppy, 4 seeds.
25 *Argemone alba* Lestib.....Prickly-poppy, 2 seeds.
26 *Brassica nigra* (L) Koch.....Black Mustard, 4 seeds.
27 *Brassica arvensis* (L) B. S. P.....Charlock, Wild Mustard, 4 seeds.
28 *Brassica campestris* L.....Turnip, 2 seeds.
29 *Lepidium campestre* (L) R Br.....Field Peppergrass, 4 seeds.
30 *Lepidium Virginicum* L.....Peppergrass, 4 seeds.
31 *Camelina sativa* (L) Crantz.....False Flax, 4 seeds.
32 *Conringia orientalis* (L) Dumort.....Hare's-ear Mustard, 4 seeds.
33 *Erysimum repandum* L.....Spreading Mustard, 4 seeds.
34 *Bursa Bursa-pastoris* (L) Britton.....Shepherd's-purse, 4 seeds.
35 *Thlaspi arvense* L.....Penny-cress, 4 seeds.

From original photographs by P. A. Hinman and J. M. Van Hook.

PLATE II


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PLATE III.

Each magnified about 5 diameters.

No. 1 *Potentilla Monspeliensis* L.....Tall Fivefinger, 4 seeds.
2 *Trifolium repens* L.....White Clover, 4 seeds.
3 *Trifolium hybridum* L.....Alsike Clover, 4 seeds.
4 *Trifolium pratense* L.....Red Clover, 4 seeds.
5 *Trifolium incarnatum* L.....Crimson Clover, 4 seeds.
6 *Medicago lupulina* L.....Yellow Trefoil, Black Medick,4 seeds—1 with
7 *Medicago sativa* L.....Alfalfa, 4 seeds. [covering
8 *Onobrychis sativa* Lam.....Sainfoin, 2 seeds—1 with covering.
9 *Ornithopus sativus* Brot.....Serradella, 2 seeds—1 with covering.
10 *Lotus corniculatus* L.....Bird's-foot Trefoil, 2 seeds.
11 *Coronilla scorpioides* L.....Axseed, 2 seeds.
12 *Cuscuta arvensis* Beyr.....Field Dodder, 4 seeds.
13 *Cuscuta Epithymum* Murr.....Clover Dodder, 4 seeds.
14 *Geranium Carolinianum* L.....Crane's-bill. 4 seeds.
15 *Euphorbia nutans* Lag.....Spurge, 4 seeds.
16 *Euphorbia maculata* L.....Spotted Spurge, 2 seeds.
17 *Acalypha Virginica* L.....Three-seeded Mercury, 4 seeds.
18 *Malva rotundifolia* L.....Low Mallow, 4 seeds.
19 *Hibiscus Trionum* L.....Bladder-ketmia, 4 seeds.
20 *Abutilon Abutilon* (L) Rusby.....Indian Mallow, 2 seeds.
21 *Sida spinosa* L.....Prickly Sida, 2 seeds.
22 *Croton capitatus* Michx.....Croton, Hogwort, 2 seeds.
23 *Onagra biennis* (L) Scop.....Evening Primrose, 2 seeds.
24 *Carum Carui* L.....Caraway, 2 seeds.
25 *Daucus Carota* L.....Wild Carrot, 4 seeds.
26 *Pimpinella Saxifraga* L.....Pimpernel, 2 seeds.
27 *Lithospermum arvense* L.....Wheat-thief, 4 seeds.

From original photographs by P. A. Hinman and T. M. Van Hook.

PLATE III

PLATE IV.

Each magnified about 5 diameters.

No. 1 *Ipomoea hederacea* Jacq.....Field Morning-glory, 2 seeds.
2 *Amsinckia intermedia* F & M.....Amsinckia, 2 seeds.
3 *Amsinckia tessellata* Gray.....Amsinckia, 2 seeds.
4 *Verbena urticifolia* L.....White Vervain, 4 seeds.
5 *Verbena hastata* L.....Blue Vervain, 4 seeds.
6 *Nepeta Cataria* L.....Catnip, 4 seeds.
7 *Prunella vulgaris* L.....Self-heal, 4 seeds.
8 *Lamium amplexicaule* L.....Henbit, 4 seeds.
9 *Salvia lyrata* L.....Sage, 2 seeds.
10 *Hedeoma pulegioides* (L) Pers.....Pennyroyal, 4 seeds.
11 *Perilla frutescens* (L) Britton.....Perilla, 2 seeds.
12 *Solanum Carolinense* L.....Horse Nettle, 4 seeds.
13 *Solanum Dulcamara* L.....Climbing Bittersweet, 2 seeds.
14 *Verbascum Blattaria* L.....Moth-mullen, 4 seeds.
15 *Plantago major* L.....Broad Plantain, 4 seeds.
16 *Plantago Rugelii* Dec.....Rugel's Broad Plantain, 4 seeds.
17 *Plantago lanceolata* L.....Narrow or Buckhorn Plantain, 4 seeds.
18 *Plantago aristata* Michx.....Bracted Plantain, 4 seeds.
19 *Sherardia arvensis* L.....Blue Field-madder, 2 seeds.
20 *Cichorium Intybus* L.....Chicory, 2 seeds.
21 *Taraxacum Taraxacum* (L) Karst.....Dandelion, 2 seeds.
22 *Picris echioides* L.....Worm Salad, 2 seeds.
23 *Lactuca virosa* L.....Prickly Lettuce, 4 seeds.
24 *Lactuca saligna* L.....Willow Lettuce, 4 seeds.
25 *Hieracium aurantiacum* L.....Golden Hawkweed, 4 seeds.
26 *Sonchus asper* (L) All.....Sow-thistle, 2 seeds.
27 *Sonchus oleraceus* L.....Sow-thistle, 2 seeds.
28 *Achillea millefolium* L.....Yarrow, 2 seeds.
29 *Anthemis Cotula* L.....Mayweed, 4 seeds.
30 *Chrysanthemum Leucanthemum* L.....Oxeye Daisy, 2 seeds.
31 *Erechtites hieracifolia* (L) Raf.....Fireweed, 2 seeds.
32 *Matricaria inodora* L.....Scentless Camomile, 2 seeds.

From original photographs by **P. A. Hinman and J. M. Van Hook.**


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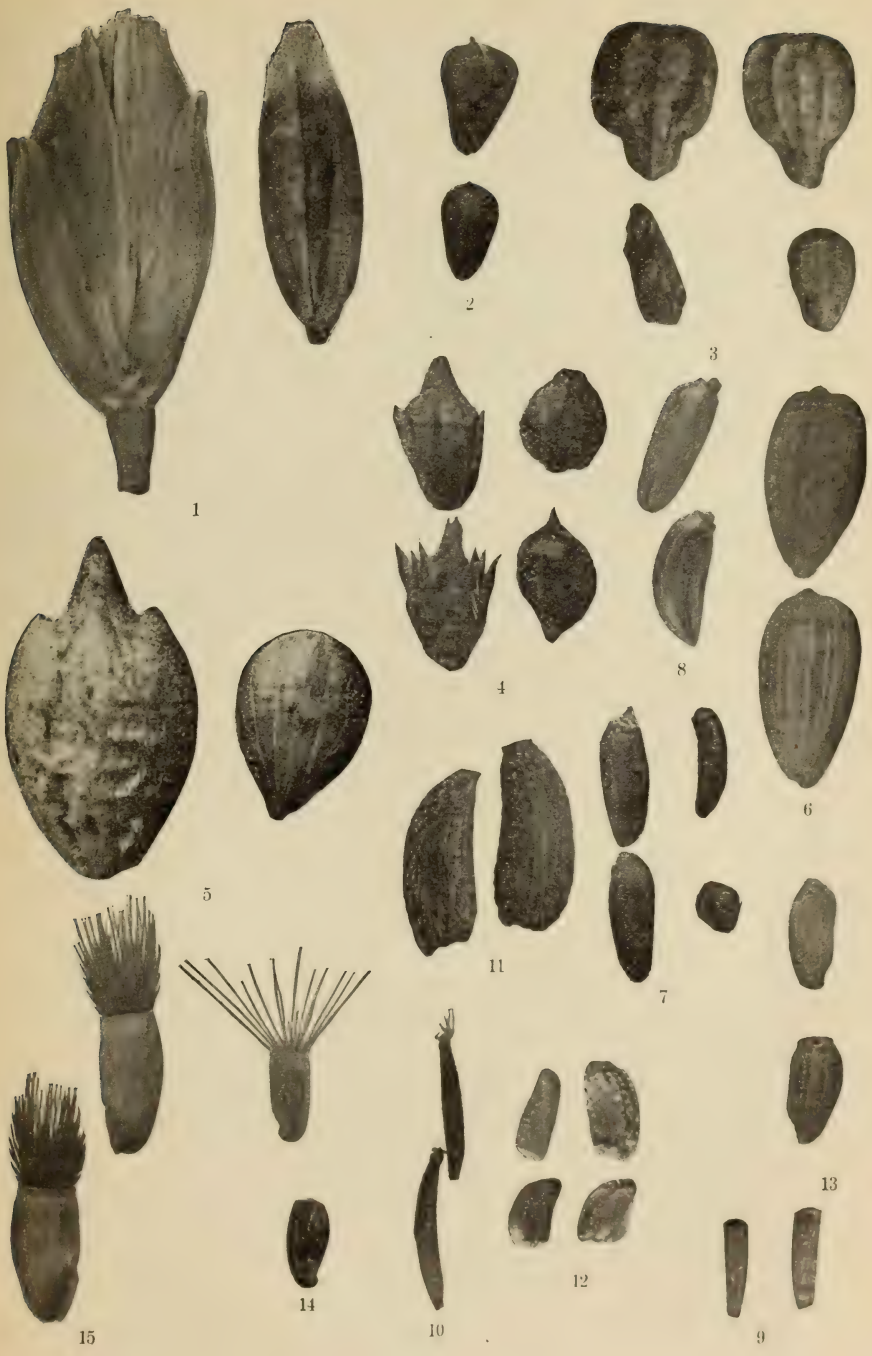
PLATE V.

Each magnified about 5 diameters.

No. 1 *Triticum spelta* L.....Spelt, spikelet and seed
2 *Iva xanthiifolia* (Fresen) Nutt. .....Marsh Elder, 2 seeds.
3 *Iva ciliata* Willd.....Marsh Elder, 4 seeds.
4 *Ambrosia artemisiæfolia* L.....Ragweed, 4 seeds.
5 *Ambrosia trifida* L .....Great Ragweed, 2 seeds.
6 *Helianthus annuus* L.....Sunflower, 2 seeds.
7 *Carduus arvensis* (L) Robs.....Canada Thistle, 4 seeds.
8 *Carduus lanceolatus* L.....Common Thistle, 2 seeds.
9 *Rudbeckia hirta* L.....Yellow Daisy, 2 seeds.
10 *Leontodon autumnale* L.....Fall Dandelion, 2 seeds.
11 *Arctium Lappa* L.....Burdock, 2 seeds.
12 *Grindelia squarrosa* (Pursh) Dunal.....Gum-plant, 4 seeds.
13 *Centaurea Jacea* L.....Brown Knapweed, 2 seeds.
14 *Centaurea solstitialis* L.....Star Thistle, 2 seeds—these come with and
15 *Centaurea Cyanus* L.....Blue-bottle, 2 seeds. [without pappus.

From original photographs by P. A. Hinman and J. M. Van Hook.

PLATE V



INDEX BY TECHNICAL NAMES.